a journal for precision engineers and all users of industrial diamonds and other hard materials

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MICROSTRUCTURES OF DIAMOND SURFACES

By S. Tolansky, D.Sc., F.R.S.

Read what the Reviewers say about this important book :—

This is a delightful book : firstly because it is a record of a piece of highly individual research by one school supervised and inspired by one man ; secondly, because it is superbly illustrated. Indeed, although the letterpress is easy to read, the ideas being clearly and simply expressed, it is probably the plates that will sell the book . . . Prof. Tolansky has developed new and very powerful optical techniques which actually reveal and enable him to measure surface steps or discontinuities of as little as 10 A., the effective useful magnification in such a case being X 500,000. . . . Cleavage, polishing, etching and sawing of diamond faces, octahedral, cubic, and dodecahedral, are all discussed in the light of really remarkable photographs, and some information is given on the difficult problem of " the two types of diamond."—Kathleen Lonsdale in " Science Progress."

Prof. Tolansky has been well served by the Goldsmiths' Press, whose wide experiences of diamond publishing has doubtless contributed to the success with which they have reproduced so many of his magnificent photographs of diamond surfaces. . . . Although all these methods are simple applications of well-known optical principles, it has remained for Prof. Tolansky to develop them into an extraordinary powerful array, needing skill to be sure, for their successful application, but comparatively little equipment beyond a good optical microscope to obtain one-dimensional resolution which compares favourably with that of the electron microscope. . . . The appearance of this book will be a welcome stimulant to many engaged in diamond research. It also provides valuable data for comparison with the artificial crystals of germanium and silicon, on which such an immense amount of effort is now being expended by the electrical industry. Since the stages of growth can actually be followed for these metals, comparative studies might well resolve some of the fascinating problems so literally brought to light by Prof. Tolansky's researches.—H. J. Grenville-Wells in " Laboratory Practice."

To those who use diamond as a tool, the information in the last two chapters, on " ring-crack " damage to diamonds, and on the surface condition of mechanically polished diamonds, should be specially worthy of study."—F. C. Franks.

Some of the traditionally accepted facts about diamond surfaces have been contradicted by Prof. Tolansky since he began studying the gem in his laboratory. His recent observations are described in " Microstructures of Diamond Surfaces." He reports, for instance, that tradition has it that diamonds have a perfect cleavage in particular directions. From optical studies of cleavage surfaces he says that " the cleavage is optically very far from perfect except in one type of diamond."—" Tooling and Production," Huebner Publications Inc.

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Some Characteristics of Diamond
The Topography of the Natural Octahedron Faces
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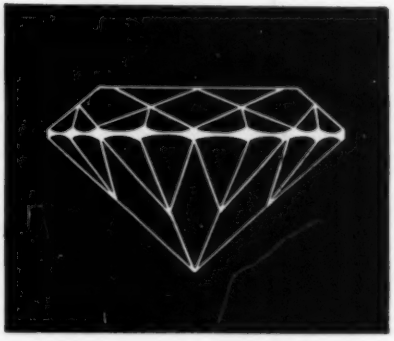
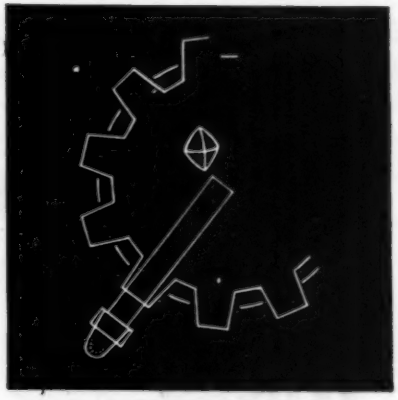


diamonds in art and industry



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Generally Speaking

Who started it all ?

The industrial uses of diamonds are so well established nowadays that they seem like a permanent part of the background in engineering, yet it is not easy to find examples of diamond as a tool, well authenticated, more than a century ago. True, there are Biblical references that have been taken to mean that diamonds were used for stone working by the Israelites, perhaps 2500 years ago, but these references are not clear and unequivocal and cannot be relied on as evidence. The same applies to the belief that the Romans used diamonds for gem engraving, although this seems quite probable. In fact, until about a hundred years ago, the only use for diamond that were not of good enough quality to be put into jewelry seems to be for diamond and other gemstone cutting. Some doubt as to whether this really was the only use for what we should now call ' Industrial Diamonds ', partly from the mention of ' Diamond Boart ' in eighteenth century East India Company forms,* and partly on the general principle that it seems unlikely that the skilled craftsmen of former ages could have entirely overlooked so useful a material as diamond, even in spite of its comparative rarity and expense.

A wider field

In addition to the more obvious uses of diamonds in jewelry and as a tool in engineering industries, there is a wide field of use in experimental science, wholly apart from the considerable amount of investigation that is being undertaken into the properties of diamond itself. The fact that it possesses some of these properties is of the greatest value in a number of ways—its hardness, its resistance to many corrosive agents that would attack other materials, its electrical and optical properties, are each of value, and diamonds are used for purpose ranging from lenses, which are scratch-proof, and, from the high refractive index of diamond, can give high

Continued on p. 179

Test Blocks for Indentation Hardness Testing

by **Mrs. J. G. Wood, B.Sc. (Eng)**

— **Communication from the National Physical Laboratory** —

Summary

The methods adopted at the NPL for the production of standard hardness test blocks in the range 200 to 950 HV for the Vickers and Rockwell indentation hardness tests are described. Typical results from examination of the finished blocks demonstrate the excellent and consistent uniformity of hardness achieved.

Introduction

Standard hardness test blocks provide the simplest and, under proper control, probably the most accurate means of verifying hardness testing machines. Such blocks, calibrated by the manufacturers or one of the standardizing authorities, are commercially available for the three principal types of indentation hardness measurement, *ie* Vickers, Rockwell, and Brinell, and for the full range of hardness required in industry. The standard test blocks provide the means for transferring to industry the standard of hardness maintained by the manufacturer or the standardizing authority, and it will be evident that (*i*) the standard is essentially vested in the machine used for their calibration, and (*ii*) the accuracy with which the standard is transferred through the medium of the test block will be very much governed by the uniformity of hardness of the block, since the calibration must be based on a sample test of five, or at most ten, indentations for economic reasons.

In recent years, a close study has been made at the National Physical Laboratory of the problems associated with the establishment and maintenance of high grade standards for the Vickers (HV) and Rockwell (HRC and HRB) scales of hardness. A new deadweight machine for the HV scale, employing loads of 30, 50, 100, and 120 kgf, and exploiting new principles of load control during the indenting process, has been constructed[1], and a new deadweight machine for the HRC and HRB scales is at present being built. A critical examination of the performance of the deadweight Vickers machine has been made. The use of statistical techniques permitted separate evaluation of the effect of most of the factors which influence the measurement of hardness by such a machine, but it was not possible to separate test block variability, *ie* variability due to non-uniformity of hardness of the block, from machine variability, *ie* variability due to random errors in the indenting procedure. To establish the precision of the machine itself it was therefore essential to use test blocks of the highest attainable uniformity of hardness. None of the commercial sources of blocks—and they were sought throughout the world—consistently provided the requisite degree of uniformity, and it was thus necessary to investigate at the Laboratory the possibility of making the more uniform blocks needed. The techniques developed provided standard test blocks covering the range 200 to 950 HV which were uniform within 10 HV at the upper end of the scale and within 4 HV at the lower end. Furthermore, all the blocks of a batch prepared at one time showed the same degree of uniformity and had closely the same hardness, a point of considerable importance when an extended series of measurements involving some two hundred or more indentations has to be made at any required hardness level. These blocks have enabled a full appraisal of the accuracy of the machine to be made. It has also been established that they are uniformly hard to sufficient depth for use in the Rockwell scale of measurement.

The availability of highly uniform standard hardness test blocks offers considerable advantages for the intercomparison of the standards of hardness maintained by manufacturers and standardizing authorities throughout the world, and thus contributes substantially to the realization of a uniform standard of hardness. It also improves the accuracy with which the standard

can be transferred to industry on the basis of a sample test of indentations. It is believed, therefore, that the techniques which have been evolved at the Laboratory will be of interest and value to those concerned with the calibration of hardness standards and a description of the techniques is given in this paper.

Material

In initial experiments to obtain blocks harder than 900 HV, a plain carbon steel (1.1% carbon, 0.4% manganese) was used. These blocks are designated V in subsequent tables of results.

In later work, when the method of production had been finalized and softer blocks were required, an alloy steel (1.0% carbon, 1.2% manganese, 0.6% chromium, 0.5% nickel, 0.4% tungsten, 0.2% vanadium, 0.2% silica, 0.01% sulphur, 0.03% phosphorus) known as 'Staytoform' was used. Blocks from this steel are designated F. Both steels were supplied in $2\frac{1}{2} \times \frac{1}{2}$ in. bar which was cut into $2\frac{1}{2}$ in. lengths to form blocks $2.5 \times 1.75 \times 0.4$ inches.

Preparation and hardening

The top and bottom surfaces of the blocks were ground to ensure a clean run-off of the heating medium. File cuts were made in the edges at the corners, so as to leave the surfaces unbroken, and a supporting wire wrapped round the periphery leaving the surfaces unimpeded.

The blocks were pre-heated to 450 deg C, and then immersed in a cyanide bath, containing 20 to 25% sodium cyanide, for seven minutes. This period was found to be sufficient for the block to attain a uniform temperature without decarbonization of the surfaces. The temperature of the bath was maintained at 760 to 780 deg C for the plain carbon steel and at 800 to 820 deg C for the alloy steel. It was found advisable to clean the bath before use with a regenerating salt to prevent stray matter adhering to the surfaces and thus reducing the effectiveness of the quench over local areas.

The blocks were quenched individually in brine, composed of 1 lb sodium chloride to 1 gal of tap water, at room temperature. Temperature changes of the quench of several degrees did not affect the uniformity of hardness but quenching in water without salt, or in oil, always produced blocks with local soft areas.

Tempering

To partially relieve stresses induced by the quench, the hardened blocks were boiled in water for one hour with a resultant reduction in hardness of the order of 60 HV. To obtain lower levels of hardness, the blocks were heated in an electric oven at temperatures ranging from 100 to 750 deg Centigrade. The oven was rapidly raised to the required temperature which was then maintained for three hours, after which it was allowed to cool slowly to room temperature.

The effect of the tempering temperature upon the hardness of the alloy steel is shown in Fig 1, which reveals a closely linear relationship over a wide temperature range and a reduction of hardness of approximately 1 HV for a degree C rise in the tempering temperature. Blocks of this steel may therefore be produced at any desired hardness between 200 and 880 HV within close limits by a suitable choice of tempering temperature.

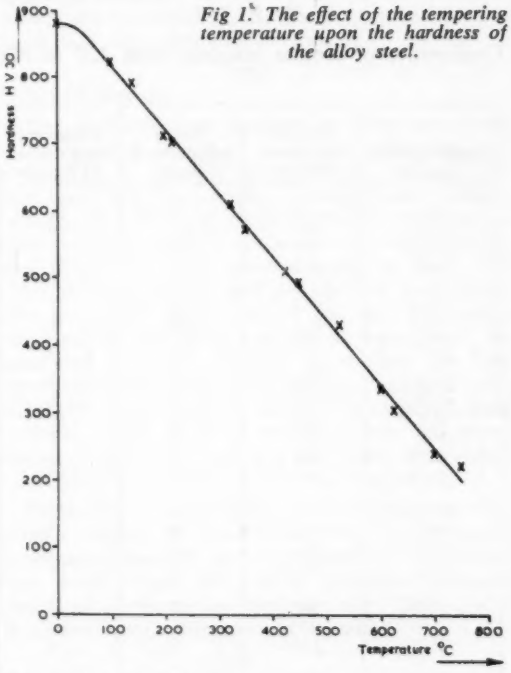

Fig 1. The effect of the tempering temperature upon the hardness of the alloy steel.

Mechanical processing

The blocks were wet ground on a rotary surface grinder using a 38A60—G8VBE wheel which was regularly dressed during the grinding operation and set to advance the cut automatically by 0.0001 in. at each traverse. The blocks were turned over frequently to compensate for up to 0.005 in. initial bend produced during hardening and to remove the distortion arising as stresses were relieved during grinding. As soon as both surfaces had been cleaned up, a further 0.004 in.

was removed from the working surface in 0.0001 in. cuts, and then 0.001 in. was removed by an automatic lapping process using Norbide 220 mesh abrasive.

The surface was brought to a bright finish, with only fine abrasive scratches, by hand lapping with 2 micron diamond dust on a cast iron lap. A final mirror finish, with a CLA roughness value of less than 0.5 micro-in., was achieved by polishing on an 8 in. diameter wheel rotating at 400 rev/min, the wheel being covered with thin rayon material moistened with ethylene glycol as lubricant and lightly impregnated with 1 micron diamond dust.

Recent limited experiments have shown that a dull lapped finish with a CLA value of 3 micro-in. can be obtained straight from grinding on a commercially available automatic lap using a fine abrasive in an oil base. This eliminates both lapping operations in the earlier procedure and is particularly useful for the soft blocks which are not amenable to hand lapping.

Tests for uniformity

The uniformity of hardness of blocks heat treated and machined by the methods described has been established in three ways.

(*i*) By indenting the blocks on the NPL deadweight Vickers machine with a load of 30 kgf and measuring the diagonals of the indentations on a specially designed measuring microscope.

(*ii*) By examining the metallurgical structure revealed by etching the polished surface of the block.

(*iii*) By determining to what depth uniform hardness extends.

Results obtained by the first form of examination are tabulated in Tables I and II in terms of Diamond Pyramid Hardness numbers, and those obtained by the third in Table III.

TABLE I

Uniformity of blocks ranging from 220 to 880 HV

Identification number	Vickers hardness HV 30	No of indentations in set	Observed range in set HV units
F.34	879	10	11
F.13	877	10	9
F.11	876	10	9
F.4	869	5	2
F.14	823	10	7
F.15	823	10	6
F.16	819	10	7
F.3	796	10	7
F.5	795	5	2
F.7	794	5	12
F.8	787	10	9
F.10	786	5	4
F.12	781	10	12
F.20	712	10	7
F.22	711	10	7
F.21	706	10	7
F.1	697	10	4
F.26	610	10	7
F.2	570	5	3
F.30	508	10	6
F.9	485	10	4
F.42	429	10	8
F.33	335	10	7
F.46	302	10	5
F.50	239	10	4
F.52	220	10	3

TABLE II

Uniformity of blocks subjected to a detailed examination

Identification number	Vickers hardness HV30	Number of sets of 10 indentations	Average range HV units	Minimum range in a set HV units	Maximum range in a set HV units
F.34	879	16	8	4	12
F.13	877	16	9	4	13
F.11	876	7	9	2	16
F.1	697	6	5	2	10
F.9	485	14	5	3	8
F.52	220	10	2	1.5	3

TABLE III

Uniformity of hardness at levels through a block

Depth (in.)	0.005	0.008	0.013	0.023	0.033
HV30	931	932	926	927	910
Range (HV units)	10	12	7	8	14

Surface hardness

A representative number of F blocks within the range 220 to 880 HV were examined by making sets of ten Vickers indentations randomly disposed over the surface of each block, though in a few cases during the initial work sets of only five indentations were made. The ranges of hardness observed in each set of indentations are given in Table I. They show that the hardening technique developed gives consistent results, and the small range at the hard end of the scale, where most difficulty is experienced by industrial manufacturers, is particularly impressive.

Although these values were obtained for a small sample of, at most, ten indentations, and therefore may not reveal the full variability of the hardness of a block, they do include additional variability due to small inherent errors in both the indenting machine and the measuring microscope.

A few F blocks which have been used extensively for experimental work provide a thorough examination of block variability. Many sets of ten indentations have been made on these blocks, and the minimum and maximum ranges observed, together with the average range, are tabulated for six blocks in Table II.

As might be expected, the maximum ranges are larger than those displayed in Table I for a single set of ten indentations, but no appreciable lack of uniformity is revealed. In contrast with Table I, where the results are affected by the variability due to small sampling, the steadily decreasing average range shown in Table II confirms the generally accepted view that uniformity is improved by tempering.

The overall range of a V type block was revealed in an experiment in which nineteen sets of five indentations were made over the surface of the block, giving average, minimum, and maximum ranges of 6, 2, and 11 HV respectively. These indentations were all made under the same conditions, and the total range observed for this very hard block of 950 HV was only 14 HV.

Surface structure

For a metallurgical examination of the hardened structure, a particularly fine polish was obtained on the test surface which was etched in a 2% nital solution, *ie* 2 vol nitric acid in 98 vol methyl alcohol, and then examined under a high power microscope. It became evident that a block of uniform hardness showed only martensitic structure and that the presence of areas of troostite gave rise to inferior uniformity. This fact was demonstrated by the correlation between measurements of 35 indentations uniformly spaced over the surface of a V block and the structure surrounding each indentation, which was revealed by etching to a limited extent so that the troostite areas were appreciably affected whilst the martensite was only lightly attacked. The average hardness of the troostite areas was 924 HV with a range from 902 to 939 HV, while the average hardness of the martensite areas was 943 HV with a range from 940 to 949 HV. It should be noted that these ranges do not overlap and the results emphasize the importance of fully hardening the steel in order to obtain the uniformity conferred by martensitic structure. These distinct ranges also show the danger of applying statistical techniques to hardness values, which are unlikely to be normally distributed if more than one structure is present

Depth of hardness

The uniformity of hardness at different depths was obtained for a V block by indenting and etching at five levels through the block. The first level was the normal working surface which is between 0.005 and 0.010 in. below the original surface, and further amounts of 0.003, 0.005, and 0.010 in. were ground away in turn, the surface being lapped and polished at each stage. The average hardness measured and the range revealed by five indentations at each level are tabulated in Table III and show that the first appreciable decrease in hardness occurred at a depth of about 0.030 in. below the usual working surface. This surface was the first to reveal traces of troostite and was therefore considered to be the limiting depth for full hardening.

From the constitution of the alloy steel a greater depth of hardening may be expected from the F blocks, and it is therefore concluded that both types of blocks provide sufficient depth of uniform hardness for the Vickers and Rockwell tests envisaged at the Laboratory.

Conclusions

The three most important factors affecting the heat treatment process adopted are that the salt bath shall be free from sludge, that the temperature of the blocks shall be within the prescribed limits when quenched, and that the quench shall be rapid and uniform. The latter requirement was only fulfilled by the use of a brine bath.

During mechanical processing the grinding conditions are particularly critical: localized

overheating of the surface by using a wheel of incorrect mesh size or bonding, or by using too heavy a cut at any stage of the surfacing, may ruin an otherwise satisfactory block. It was for this reason that the removal of at least 0.001 in. of metal by mechanical lapping was introduced since even the lightest grinding produces some local overheating.

Flatness of the lower surface of the block is more important than is sometimes realised. A rocking block will enlarge Vickers indentations, while a block which flexes under load will not permit true depth measurement in the Rockwell test. Attention must therefore be paid to the grinding of this surface.

A mirror finish, which is readily obtained with diamond dust polishing, even with soft blocks, is considered to be essential if precision is to be obtained from the Vickers test. The high reflectivity of the polished surface increases the contrast between the indentation and the surrounding surface of the block seen in the measuring microscope, and, in addition, the corners of the indentations are not marred by scratches or grinding marks. The mirror finish also provides a surface suitable for etching, and this technique provides a rapid means of revealing the presence of soft spots which is particularly useful during periods of experimental hardening or if there is doubt concerning the quality of a block.

Hardness test blocks are now made by the heat treatment and finishing methods described with consistently successful results, and the uniform blocks so provided have enabled a critical appraisal to be made of both the standard deadweight machine and the prototype measuring microscope which were built for the Vickers test at the NPL. In addition, they have enabled a critical examination to be made, in both Vickers and Rockwell tests, of the influence of small variations in the indenting cycle, and have confirmed what had been earlier suspected, that the cycle must be precisely defined.

Acknowledgements

The author wishes to acknowledge the advice of Mr H. Bull, of Messrs Brown Bayley Steels Ltd, Sheffield 10, who recommended the use of 'Staytoform' steel, and the advice and assistance of Mr R. S. Marriner throughout this work.

The work described above has been carried out as part of the research programme of the National Physical Laboratory, and this paper is published by permission of the Director of the Laboratory.

Reference

1 A new standard hardness testing machine, by R. S. Marriner and F. C. P. Mason
Machinery (London) 1957 Vol 91 p 1225
Machine Shop Mag 1958 Vol 19 p 31
Metallurgia 1958 Vol 57 p 47
Engineering 1958 Vol 185 p 339

Chrysler Cuts Aluminium with Diamond Tools*

Single-point diamond tools are now production proved for aluminium die castings that go into Powerflight automatic transmissions. This hardest natural material works well as a cutting tool, resisting abrasion from the work, holding dimensions within ±0.001 in., and producing finishes to 20 microinches.

Chrysler changed its kickdown planet pinion carrier from a malleable-iron casting to an aluminium die casting to reduce weight and improve heat dissipation. But conventional tools suffered from the abrasiveness of the aluminium, and dimensions were not met satisfactorily. In particular, the high finish was necessary to act as a seat for a composition spacer, and standard tools could not produce this finish.

Diamond tools were adapted for the boring and facing job, after a considerable amount of testing and experimenting. Results were immediate—no tolerance troubles, higher production, scrap reduced, and lower costs. The sharp diamond tool edges do not allow build-up of aluminium chips under the tool tip.

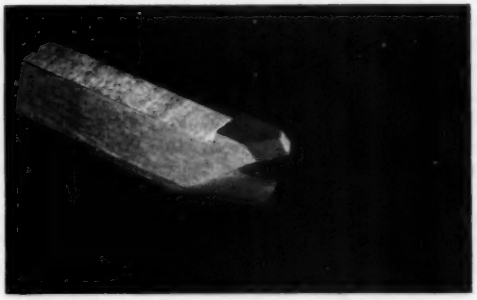

Fig 1. Diamond tool is a single stone cemented to a steel holder.

The die castings are machined on a two-station boring machine at 2,500 rev/min and at 722 surface ft/min, cutting 0.008 in. deep.

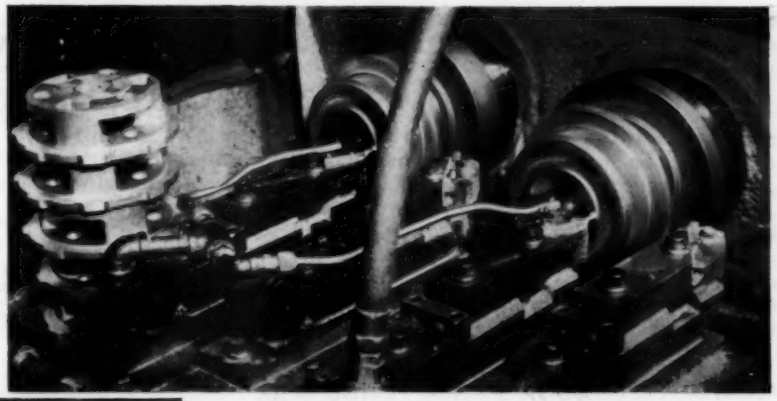

Fig 3 (below). Work is a kickdown planet pinion carrier die cast in 85-100 Bhn aluminium, and machined to mirror finish by the diamond.

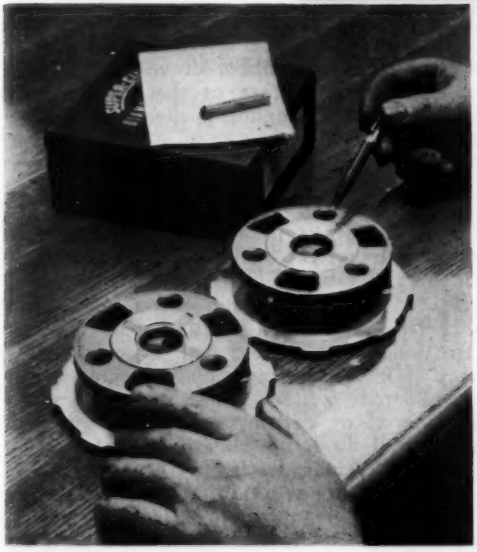

Fig 2 (above). Diamonds bore and face pinion carriers at production rates on a two-station New Britain Cam-numatic 37 at Chrysler's Indianapolis plant.

Cycle time for the job is 0.38 minutes. No coolant is applied.

This application for diamond tools, a new one in mass production, was the subject of intensive tests and reports before it was released to the shop. It has proved economical and practical.

Because many more aluminium and aluminium-alloy parts are coming up in automotive production, more attention is being given to diamond tools. In mass production set-ups, the sharp cutting edges that do not change dimensions are necessary for machining the soft, abrasive aluminium alloys.

* Reprinted by permission from *American Machinist* 1959 Vol 103 (12) p 113 (June 15).

Fifth International Automation Exposition Postponed

PITTSBURGH. Management for the Fifth International Automation Exposition and Congress has announced postponement of the show scheduled for the New York Trade Show Building, November 16-20, 1959. Reasons for the postponement were not given, although it was hinted that the current anti-automation attitude of labour and some management played an important role in the decision. 'The public will have to be educated to the great possibilities and sound economic reason for the need for automation', remarked a spokesman, 'meanwhile, we pioneers will have to mark time'. The show will be re-scheduled for 1961.

CORRECTION

In last month's Industrial Diamond Review an article by R. G. Weavind, entitled 'Factors effecting the efficiency of resinoid bonded diamond wheels', appeared on pages 146-153. We regret that the blocks for Figs 2 and 3 appeared in the wrong order and therefore the block shown over the caption for Fig 2 should belong to Fig 3 and vice versa.

Portuguese Diamond Cutting Plant

An exclusive licence to install and operate a diamond cutting plant has been granted to the Sociedade Portuguesa de Lapidacao de Diamantes SàRL. The company, constituted in December 1959 with a capital of 150 million escudos, is required under the licence to erect installations in or near Lisbon within three years.

New Developments in Coring with the Rubber-Sleeve Core Barrel*

by **B. L. Austin****

Summary

The rubber-sleeve core barrel has now been proved by extensive field use in the United States and in Venezuela. High percentages of recovery and excellent quality cores have been obtained in hitherto unrecoverable formations. Sand grains are retained in their original orientation even in the softest of cores. Flushing of the core by well fluids after the core has been cut is eliminated by packaging the core in the rubber sleeve as the core is cut. The barrel includes an hydraulic feed joint that acts as an automatic driller and keeps a constant weight on the bit. This same feed-off principle makes possible a mechanism that pulls the rubber sleeve and core up into the core barrel as the core is formed. The core is thus relieved of any compressive loads, and any possibility of the core's wedging is eliminated. New bit designs have been made which reduce core wash and provide excellent penetration rates in formations not previously considered suitable for diamond coring.

Introduction

The introduction of diamond core barrels to the petroleum industry in 1946 at Rangely, Colorado, marked a major step toward achieving the goal of maximum core recovery under normal well conditions. It has been estimated that conventional diamond core barrels in operation throughout the world today recover in excess of 90 per cent of the total of all footage that is cored with this equipment. Unfortunately, however, all too often the small percentage of core that is not recovered happens to be the particular section of most vital interest to the reservoir analyst. Also, many soft unconsolidated sands are encountered that are prolific producers but which have been virtually impossible to recover with conventional core barrels; or, if partially recovered, the cores are of such poor quality that they are of little value. The necessity of obtaining more complete and reliable reservoir information in many areas led the research department of a major oil company to begin development of a new coring device specifically designed to combat these problems. The rubber-sleeve core barrel, which is presently being marketed in the United States and in some other areas, is the result of this original programme.

Features of the barrel

There are many differences in construction and operation between a conventional diamond core barrel and the rubber-sleeve barrel. The most outstanding feature of the rubber-sleeve barrel, as the name implies, is that a tight-fitting rubber sleeve encases the core as it is formed, thereby performing a number of important functions. The rubber-sleeve, which is pulled into the core barrel at the same rate that the core is formed, acts as a cylindrical conveyor, supporting the weight of the core and transporting it into the barrel. Because this sleeve is $2\frac{3}{8}$ in. ID in its free state and is stretched over a 3 in. core, a substantial force similar to the overburden pressure is exerted on the core tending to keep it in its original state. Fractured and unconsolidated sections or formations which tend to swell or decompose when in contact with the well fluids are therefore contained so that they will not bridge in the inner barrel and cause the core to be ground up. This compacting force also retains most unconsolidated sand formation in an undisturbed condition with the individual grains remaining in their original orientation.

The rubber sleeve principle will not provide a theoretically uncontaminated core since invasion of the reservoir by the well fluids may be an instantaneous phenomenon, occurring even before the core is formed. However, packaging of the core immediately after it is cut and isolating it from moving fluids as it is forming does tend to retain the core in the as-cut state with much less contamination than is possible by other means. It also reduces to a minimum the deleterious effect that may occur as a result of prolonged submersion of the core in the well fluids.

An interesting example of this occurred recently in Eastern Venezuela where the rubber sleeve barrel was used to core a section origin-

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* Paper to Spring meeting of the Mid-Continent District Div of Production, Herring Hotel, Amarillo, Texas, April 22-24, 1959.

** Christensen Diamond Products Company, Salt Lake City, Utah.

ally described as a 'soft-to-mushy' unconsolidated sand. When the cores were recovered, they were found to be quite well compacted, almost firm. Yet when removed from the rubber sleeve and submerged in mud, these cores would decompose rapidly. With this knowledge, it is easy to understand the poor quality cores and low recovery percentages obtained with conventional barrels.

Operation of the barrel

Although the rubber sleeve barrel is a substantially more complex tool than a conventional diamond barrel, its operation in the hole is trouble-free and, in many respects, simpler than a conventional barrel. When the barrel is being run into the hole, Fig 1, it is possible to apply weight, rotate, and circulate as is occasionally necessary in order to wash out bridges and work through tight spots. Once bottom has been reached and circulation established, the stripper-tube release plug is dropped into the drill pipe and circulated to its seat in the top of the stripper tube. When the release plug is properly seated, as shown by an increase in circulation pressure, the fingers of the stripper tube latch are spread open, which allows the splined joint to be collapsed its full stroke of 2 ft, Fig 2. At this time, the brake on the drawworks is tied down while the splined joint extends and the first 2 ft of core are cut.

Weight on the bit is provided by the pressure drop developed at the nozzles acting across the area of the splined joint seal, while the torque is transmitted by the splined joint. As the bit head penetrates the formation and the splined joint starts to extend, the stripper tube is prevented from moving downward by the top stripper tube ratchet spring. Consequently, the rubber sleeve, which is attached to the lower end of the stripper tube, is pulled into the lower inner barrel as the bit head and core barrel advance downward over the core. The stripper tube in this manner might be said to pull the rubber and core into the core barrel.

Fig 1, 2, and 3. Successive stages during the use of the Rubber-Sleeve Core Barrel.

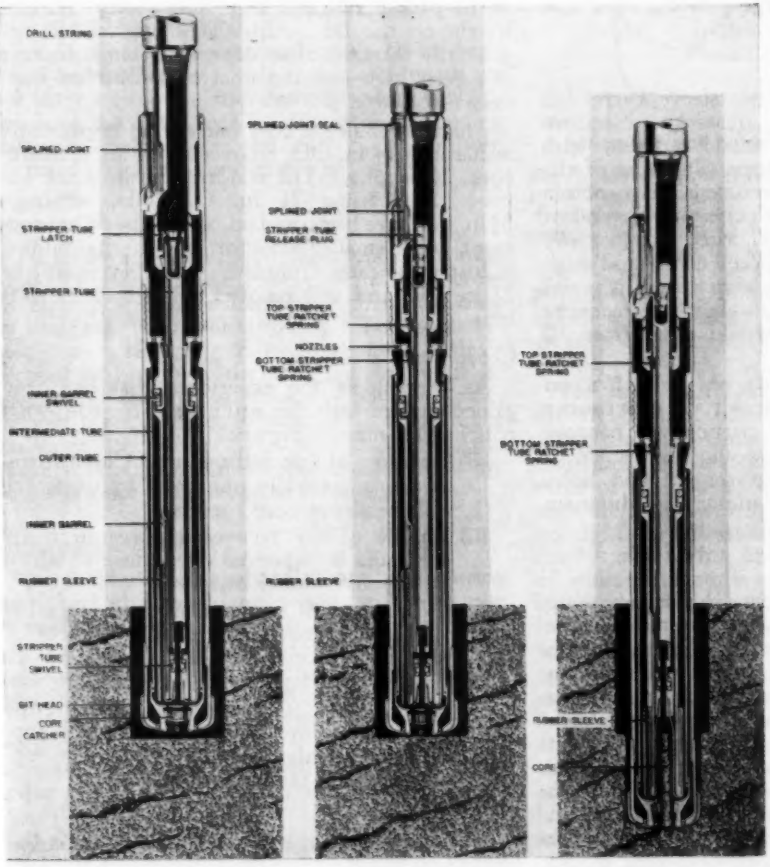


Fig 1 Fig 2 Fig 3

When 2 ft of core have been cut, Fig 3, an increase in indicated weight on the hook plus loss of rotary torque is observed. Rotation and circulation are then stopped and the drill pipe is lowered another 2 feet. While this is happening the top stripper tube ratchet spring is carried down over the stripper tube with the male half of the splined joint. The bottom stripper tube ratchet now catches the stripper tube and prevents it from moving downward and disturbing the core. In this manner the stripper

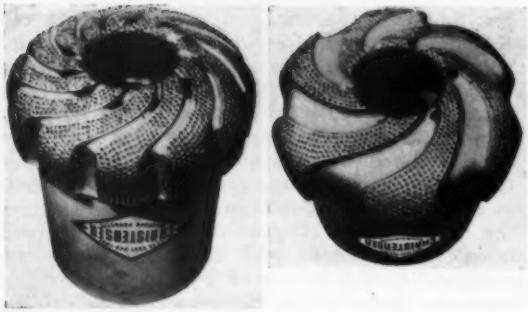


Fig 4 and 5. Diamond Drill Bits as used with the Rubber-Sleeve Core Barrel.

tube is held stationary in elevation during the time the core is being cut; and the rubber sleeve, once it has been pulled off the inner barrel, remains stationary with respect to the core that it surrounds.

Field applications

The field use of the rubber sleeve barrel has been limited generally to areas where unconsolidated formations have made recovery with standard barrels unsatisfactory. In most of the recent applications it has been possible to obtain recovery in the range of 90 per cent. Several of these wells could have been cored satisfactorily with a conventional diamond barrel, and high recoveries would have been anticipated, whereas others were problem applications where recovery with conventional barrels would range from 10 to 60 per cent.

The majority of core that has been lost on these jobs has been the result of the rubber sleeve being damaged and parting, or because the core was so soft that it would not remain in the rubber during the trip out of the hole. Work is continuing in an attempt to eliminate both of these problems.

Bits used

The use of diamond core heads in these extremely soft and unconsolidated sands has not been regarded as a necessity in the past. Much of this type of coring has been done with tungsten carbide faced drag bits of various designs. As a matter of fact, when the original rubber sleeve barrels were run, this was the only type of bit that was considered. It was soon found in the field, however, that these unconsolidated sections were seldom massive bodies that did not contain at least occasional shale breaks. The need arose almost immediately for a core head that would meet the following specifications:

(*i*) rapid penetration in soft sections;
(*ii*) ability to penetrate firm-to-hard sections;
(*iii*) adequate fluid control to avoid washing of soft sands;
(*iv*) ability to penetrate with light loads; and
(*v*) low cost/foot.

The diamond bits presently in use with the barrel, Fig 4 and 5, have more than lived up to these requirements. The unique ability of diamond bits to retain their shape throughout their full life has made possible the solution to the problem of fluid control. Penetration rate in both soft and hard formations has been excellent. Two-foot sections have been cored as rapidly as 2 to 3 sec, while the harder shales have occasionally required as long as 40 min/foot. It is believed that the hydraulic feed joint in the core barrel has contributed substantially to the good penetration rates, since it is automatically fed off at the proper rate and maintains a very constant weight on the bit. Although diamond bits are generally thought of as expensive items, footage has been high and the final cost/foot has been very favourable.

The rubber-sleeve core barrel that is presently available is $6\frac{7}{8}$ in. OD, recovering a 3 in. diameter core, 20 ft long. The majority of the work has been done using $7\frac{1}{2}$ in. OD bits, although $8\frac{3}{8}$ in. bits have been used on occasions. Development of a smaller size for use in the mining industry is nearly complete. This barrel will be $2\frac{7}{8}$ in. OD and will recover a $1\frac{7}{16}$ in core 10ft long

Conclusions

As a result of the experience that has been gained to date with this equipment, the following conclusions may be drawn:

(*i*) recovery of soft and unconsolidated formations is generally improved by using the rubber sleeve core barrel;
(*ii*) quality of the recovered cores in many instances is improved over those obtained with conventional barrels;
(*iii*) the equipment that has been developed is suitable for use under a wide variety of well conditions and has proved to be durable and dependable in operation; and
(*iv*) further work is indicated in assessing the value of the cores obtained and in developing new methods of analyzing the unconsolidated samples obtained.

Bibliography

Hildebrandt, A. B., Bridwell, H. C., Kellner, J. M., Development and field testing of a core barrel for recovering unconsolidated oil sands, AIME Paper No 880-G, presented at Ann Mtg of the Society of Petroleum, Engineers of AIME, in Dallas, Texas, October 6-9, 1957.

Resetting a Wheel-Truing Diamond

by John Waller

Introduction

Generally, the work of resetting a diamond in the steel bar type of holder which is used extensively in the engineering workshops is not a difficult task, but the nature of the job requires some degree of skill and for this reason the tool fitter is usually the person responsible for bringing another surface of the diamond uppermost and seeing that it is retained securely in the holder. The method described here is typical of many workshops which use a selection of these industrial diamonds on the various grinding sections throughout the factory, and, with reasonable care, there is little or no risk of a cracked or lost diamond.

For best results a diamond needs to be kept sharp—continued use will eventually result in the stone's having a rounded top surface which becomes worn to such a degree that dressing back the holder material can cause a loose diamond which will fly out and be lost.

Removing the diamond

To remove the diamond the metal remaining round the stone is filed away to leave it completely exposed. The diamond is then held only by the brass used when brazing. The holder is held over a ladle, Fig 1, while a gentle flame is allowed to play over the end; too heavy an air blast will blow the diamond from the ladle. Two or three minutes is sufficient to loosen the brass, and the stone drops into the ladle from where it is retrieved and kept carefully until the holder is once again ready to receive it.

Preparing the holder

The holder becomes badly mutilated during the diamond removal operation, and after one or two such removals a new holder made from bar material is essential. However, the following is the sequence of operations necessary when resetting the stone, and, assuming the bar to be set up truly in a chuck on a small lathe, the end is faced off, a hole drilled for a certain depth, and three saw cuts made either while it still remains in the chuck, or by transferring it to the bench vice.

The drilled hole should only just clear the stone, and a drill is selected which is a few thousandths of an inch larger than the widest

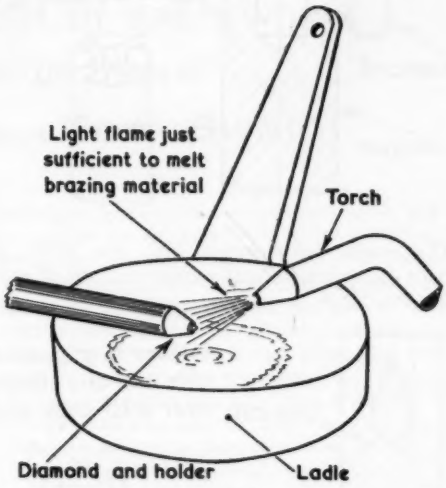


Fig 1. Removing the diamond from the worn out holder is the initial stage in recovering the stone. This is accomplished as shown in the drawing by holding the tool over a ladle while applying heat to melt the brazing material.

portion of the diamond; a brief check with the aid of a micrometer of what is apparently the greatest distance will quickly determine the size of drill to use.

The hole is drilled slightly deeper than the overall length of a diamond, as in Fig 2; the stone stands on the angular cone and it is from this that the depth is ascertained when checking. A piece of wire poked into the hole and compared with the diamond will eventually give the necessary 3/32 in. shown on the drawing. Each saw cut is made with a fine metal saw of about 1/64 in. wide. Each cut is made to break into the hole, and when finished, will appear as shown in Fig 3. Incidentally, the cut is finished by tilting the saw to give the angle shown in Fig 4. As the sawing operation can throw up tiny burrs and leave sawing dust inside the hole, a fine file is used to finish the cuts—a mere two or three brushes across the surface is enough to restore the edge, and the dust is then blown away with the aid of an air blast. Any small fragments left in a hole can cause a faulty seating of the stone, which could then work loose after a few passes over a grinding wheel. A clean hole is thus essential before inserting the diamond.

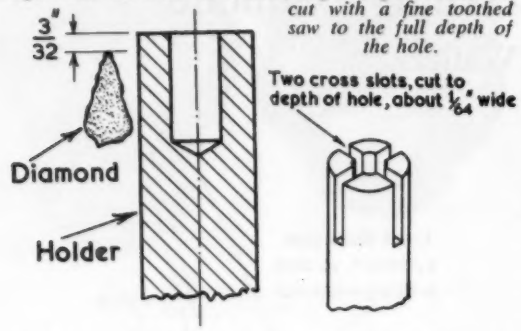


Fig 2 (left). The diamond is measured, and a hole just larger than the stone is drilled; Fig 3 (right). Slots are cut with a fine toothed saw to the full depth of the hole.

The stone is dropped into the hole, new surface uppermost, and adjusted until it stands correctly, Fig 4.

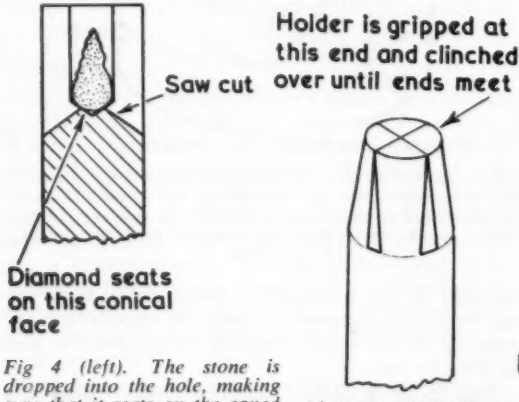


Fig 4 (left). The stone is dropped into the hole, making sure that it seats on the coned portion made by the drill. All chippings are carefully removed prior to this operation; Fig 5 (right). The holder is clinched over until the jaws grip the stone. Excessive pressure should be avoided.

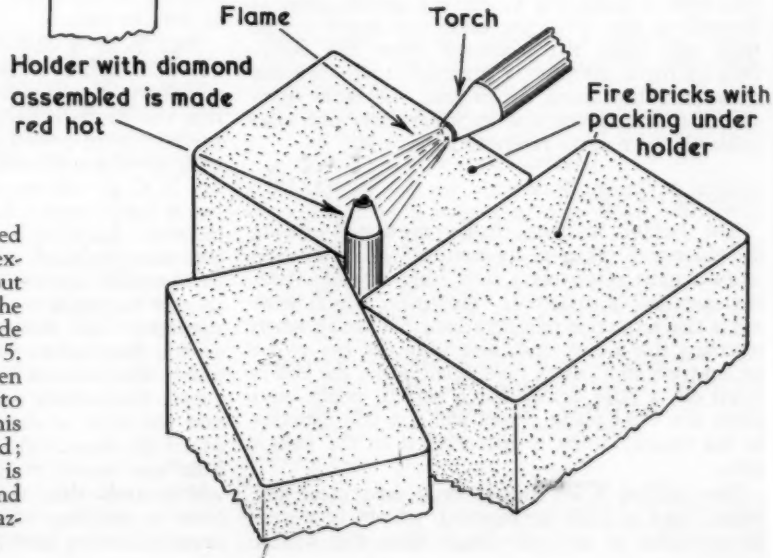
The holder is now gripped in the vice jaws on the extreme ends, and by gently but firmly tightening the jaws the ends of the holder are made to close over the stone, Fig 5. Once the stone has been gripped there is no need to exert further pressure as this could crack the diamond; the purpose of closing-over is simply to hold the diamond while the more positive brazing operation is performed.

Brazing

For the brazing process, a set-up of the type shown in Fig 6 is used. Three firebricks are packed round the holder to keep it upright, and, with a suitable piece of packing underneath, sufficient is raised above the bricks for the flame to heat an inch or so. Wet Borax flux is next brushed over the surface of the holder, and the flame is adjusted to bring it to a red heat. Again, there is no point in using a very violent flame for this process, and a slow, gentle flame is best as it will heat the holder for a considerable length. The brazing wire is dipped in Borax flux and then touched on the red hot holder, whereupon it will melt and run into the cracks made by the sawcuts. If the brass does not immediately commence to run, reheating is necessary as the correct temperature has not been reached.

Fig 7. Finally the exposure of the stone is necessary and a dual operation of turning the front end, and afterwards filing it, will allow a sufficient area of the diamond to stand clear of the holder. A blunt cone is preferable as this gives a stronger seating.

Fig 6 (below). Brazing with the holder held between firebricks is the next process.



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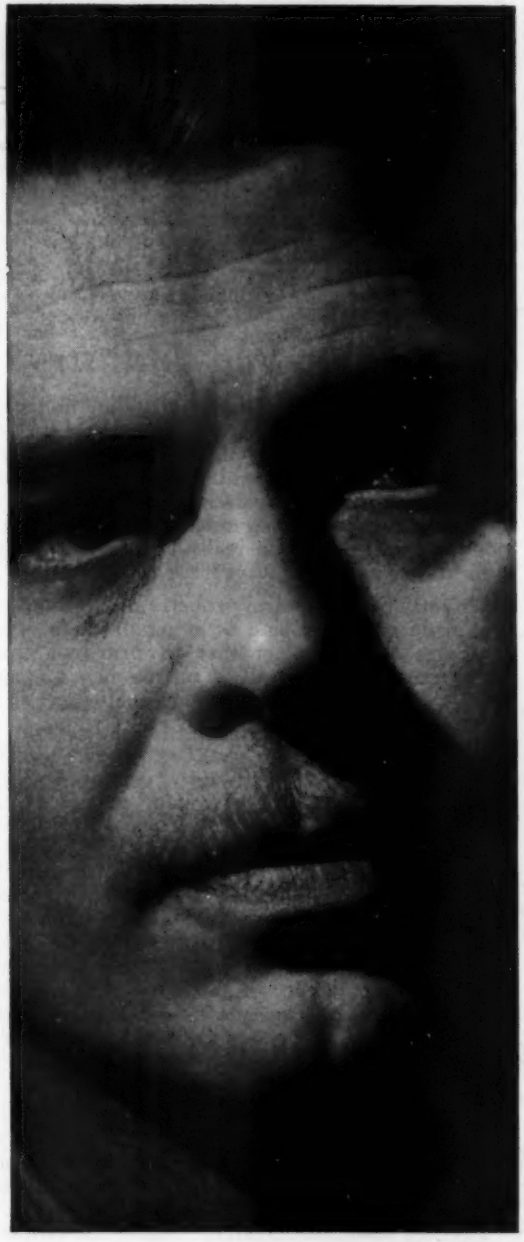
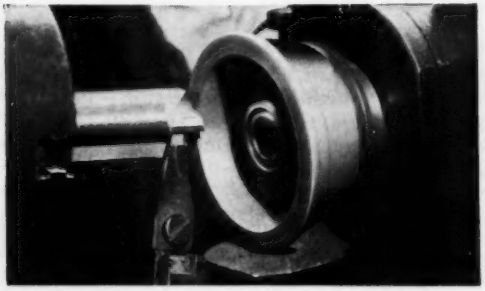


"We get more jobs out of each wheel with these" says **Tom Swain**

Tom Swain is the charge-hand of the cutter-grinding shop of Jonas & Colver (Tools) Limited. Most of the tools they grind there go to the motor industry or the aircraft industry. Among the most successful production tools that Tom's men use are the resin-bonded diamond wheels made by CARBORUNDUM shown in our smaller illustration. 'We find we get more jobs out of each wheel with these.' Tom says, 'And that's important with diamond wheels. Diamonds cost money!' He might have added that long wheel-life saves time spent in wheel changing, and so increases the production rate — not a big increase, but worth something in the course of a year.



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Once the cracks have been filled the holder is placed aside for an hour and allowed to cool naturally. Any attempt to plunge it in water can crack or loosen the diamond.

Exposing the diamond

The final operation requires the exposure of the diamond ready for use when wheel truing, and this is best carried out as a dual operation. By carefully setting the holder to rotate truly in a chuck or collet in the lathe, a light skim is taken over the front end to produce the cone seen at Fig 7, continuing until it becomes apparent that the diamond is almost reached. To proceed further will cause the tool to contact the stone and perhaps ruin it, so the holder is removed from the chuck and the remainder filed away until about 1/16 in. of the stone is exposed. This final operation is fairly tedious, but care must be taken to avoid having a sharp cone which will weaken the holder round the diamond.

Any excess brazing material is removed during this stage, together with traces of flux that may remain.

Lapping with Diamonds*

Diamond lapping and polishing compounds use diamond in its most efficient form. Whereas a large diamond such as is used, for instance, in a truing tool, is fairly easily fractured owing to its size, the diamond particles used in lapping compounds have already been reduced by crushing, thus eliminating the major cleavage planes encountered in large single diamonds. The compounds are finding an increasing number of applications in industry for producing a mirror finish on a variety of materials up and down the hardness scale.

* * *

In contrast with boron carbide, aluminium oxide, and other abrasives, diamonds are not subject to further fragmentation during the lapping process, and the initial particle size will remain substantially the same during the complete lapping operation.

* * *

The compound form of diamond dust has the advantage over diamond powders in oil vehicles in that it is not subject to settling, the diamond being held in a permanent and uniform suspension. Uniform grading of diamond particles is, of course, essential for high quality, scratch-free finish, as also is the purity of the diamonds. Ninety per cent diamond and 10% of another abrasive can reduce the cutting ability of the compound to at least 90%.

* * *

Given uniformity of particle size, the next major variable to be watched is particle shape. The Diamond Research Laboratory at Johannesburg has given considerable attention to this matter and their work has been reported in *Industrial Diamond Review*.

* 'Lapping with diamonds' is the title of a publication by Diamond Dust Co, Inc, adapted from an article in *Grinding & Finishing*. The pamphlet is available, free of charge, from: Diamond Dust Co Inc, 88-19 76th Avenue, Glendale, L.I., New York, USA.

Science and Industry

The importance of diamond as an industrial and scientific material is rarely realized by the layman, who normally thinks only of the gem when diamond is mentioned, but even the regular user of diamonds in one or other of its many industrial forms rarely considers how wide its field of application really is, and in what an enormous variety of ways it can be used.

Nearly every physical property of the diamond is made use of in one or other of these applications, and the fact that in many of these characteristics diamond is outstanding amongst other natural or synthetic materials, serves to increase its importance.

The most obvious and best known of the diamond's characteristics is its hardness and this is the one most generally made use of in the engineering applications, whether for grinding hard materials or for producing an extremely fine finish. Next most obvious perhaps are its optical properties, its high refractive index and in many cases its great clarity and freedom from colour, together with its hardness, which makes it proof against scratches. These properties make diamond very suitable for the manufacture of lenses and prisms for certain specialised applications, although, of course, its hardness is a disadvantage in making it extremely difficult to work.

As well as its transparency to visible light, diamond has the useful characteristic of being relatively highly transparent to x-rays and coupled again with its hardness and its intrinsic strength, this makes it useful in a number of ways for scientific research. Again the property possessed by a number of diamonds of acting as a radiation counter detector is made use of in many ways and its chemical inertness and considerable resistance to corrosion are of great value in such applications.

BSA Organisation: Administrative Changes

In order to facilitate administration and to increase efficiency, the small tool and broach manufacturing activities carried out by BSA Tools Ltd have been transferred to two new companies:

BSA Small Tools Ltd,
Montgomery St, Sparkbrook, Birmingham 11
Telephone: VICtoria 2351.

BSA Broach Co Ltd,
Studley Rd, Redditch, Worcs.
Telephone: Redditch 1291.

These two companies, together with BSA Tools Ltd, which will continue to carry on its machine tool manufacturing activities at Mackadown Lane, Kitts Green, Birmingham 33, telephone STEchford 3071, will operate as separate and wholly owned subsidiaries of the Birmingham Small Arms Co Limited. Management will be carried on by the existing executive and personnel.

AIT Diamond Tool Co Extension

The AIT Diamond Tool Co is building a spacious plant adjacent to the present plant at 8221 N Kimball Ave, Skokie, Illinois. The new plant will hold the research and development division.

Shandon Sci Co to Represent Felker

Felker 'Di-Met' diamond wheels are now available from Shandon Scientific Co Ltd, 6 Cromwell Place, London SW 7. Wheels available are suitable for crystal cutting, ceramics, and a variety of other purposes.

US Diamond Tool Co Change

Hitchiner Mfg Co Inc, Milford, NH, has acquired all the assets of the Permattach Diamond Tool Co Inc, also of Milford. The new acquisition will conduct business under the name Permattach Diamond Tool Corporation.

Industrial Diamonds Boost Israel's Exports

An increase of 15% was registered in Israel's exports during the first half of 1959. They reached $99½ million compared to $86½ million for the corresponding period of 1958. The increase was mainly in industrial exports which went up from $41½ million to $53½ million—half in diamonds and half in other industrial goods.

Gauge and Tool Appointments

Mr L. E. Van Moppes, Chairman of L. M. Van Moppes & Sons (Diamond Tools) Ltd, has been elected a Vice-President of the Gauge and Tool Makers' Association for 1959. The President of the Association during 1959 will be Sir Stanley J. Hartley, Chairman and Managing Director of Coventry Gauge & Tool Co Limited.

Venezuelan Diamonds are 70% Industrial

Venezuela's exports of diamonds during the past 10 years accounted for about 88% of the country's total production. During that period exports reached a peak of 115,188 ct in 1956, thereafter declining to 72,889 ct, valued at 4,300,000 bolivares, in 1958. Industrial diamonds account for about 70% of total production, boart for 13.4%, and gem quality for 16.4%.

Concluded from p. 165

magnification with small size, to pressure vessels to investigate, by X-rays, the changes that take place in materials subjected to very high pressures.

Automation needs Diamond Tools

The increasing development of automated machine tools with their long running periods, and the necessity for reducing the number of adjustments wanted to a minimum, is likely to result in an increased use of diamond tools. The long life and small wear of this material makes it very suitable for the purpose. One recent and successful development in this field in England has been the production of an automatized honing machine, using impregnated diamond hones. A very high production rate, coupled with an excellent degree of finish and dimensional accuracy is claimed. A detailed description of the machines and machining methods will be given in the Industrial Diamond Review in the near future.

ADAMANT

* Industrial Diamond Review, Vol 19, March, 1959, pp 58 & 59.

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INDUSTRIAL DIAMOND ABSTRACTS

Industrial Diamond Information Bureau,
2 Charterhouse Street, London, EC 1.
Telephone : FLEet Street 1577

1959 Volume 16
SEPTEMBER

DIAMOND MINING AND INDUSTRY

The Williamson Diamond Mine. III

C .T. du Toit. *Mine & Quarry Engg* 1959 Vol 25 (5) pp 194-200 (May)

Covers the concentration of the diamonds and their final recovery. From the first treatment plant consisting of hand-operated diamond pans 4 ft in diameter and hand-operated sieves, developments and improvements have led to the installation of powered machinery so that work is done mechanically, with only three men to manage the recovery section and the final sorting, instead of the former 30 Africans with their guards. A large flowsheet on a folding page inserted into the article shows the working of the present plant which can treat 7,000 tons a day. The treatment section consists of cone separators to concentrate the prepared feed of $-1\frac{1}{2}$ in. $+10$ mesh size, using ferrosilicon as a heavy medium, and DSM cyclone separators for the -10 mesh $+16$ mesh size, using magnetite as a heavy medium. Cone separators and DSM cyclone separators are both described in detail. The final recovery by means of grease belts and electrostatic separators forms the subject of the concluding paragraphs. 25 illustr, 2 ref, 1 chart. *A* *Fb Hg.2635*

Alluvial diamond returns for March 1959

Anon. *Diamond News* etc 1959 Vol 22 (9) p 32 (June)

Rough and uncut diamond production in March 1959 for Cape Province : 5,359.00 ct of total value £47,201 (176s 2d/ct) ; Private Estates : 270.75 ct of total value £2,290 (169s 1d/ct). Thus total production amounted to : 5,629.75 ct of total value £49,491 (175s 9d/ct).
M *Ebe F.13.361*

Tanganyika's diamond exports for April

Tanganyika Dept Mines. *Diamond News* etc 1959 Vol 22 (9) p 32 (June)

Exports for April 1959 : 39,714 ct of total value £259,247 (130s 6d/ct) as compared with exports for April 1958 : 43,582 ct of total value £329,055 (151s 0d/ct). *M* *F.13.364*

Company meeting of Be Beers Consolidated Mines, Ltd

Anon. *Diamant* 1959 Vol 2 (13) pp 17-19 (June) (In English)
W *F.251*

New diamond agreement

Anon. *Diamond News* etc 1959 Vol 22 (9) p 31 (June)

In future, diamonds produced by the alluvial diggings of Sierra Leone will be exported and marketed solely through a Government diamond office which is being jointly established by the Sierra Leone Government and the Diamond Corporation.
W *F.251.3672*

A ' scientific township ' is planned

Anon. *SA Min & Engg Journ* 1959 Vol 70, Pt 2 (3466) p 175 (July 17)

The Diamond Res Lab and Diamond Abrasive Products will form part of the proposed township of Theta, near Booysens, Johannesburg. 1 illustr.
W *F.131*

Dia-Chrome moves to new quarters

The Dia-Chrome Co, 612 W Elks Ave, Glendale 4, Calif. *Grinding & Finishing* 1959 Vol 5 (3) p 57 (July)

The new address of this Company is shown above. 1 illustr. *W* *.241*

Abrasive materials

H. P. Chandler, G. E. Tucker. *US Bur Mines, Minerals Yearbook, Preprint,* 1957 20 pp, Price 15 cents

The largest section of the publication deals with industrial diamonds. A table shows world production of industrials, by country, for 1955 to 1957. Other tables show industrial diamond (excluding diamond dust and manufactured boart) imported for consumption in the US, for 1948 to 1952 (average) and for 1953 to 1957 ; industrial diamond (including diamond dust and manufactured boart) for consumption in the US, for 1956 to 1957, by countries. Numerous references relating to articles on industrial diamonds and the diamond industry are given. 18 tables.
W *Fc.13.513/Rd.526*

Market reports

S. Emmerik *et al. Diamant* 1959 Vol 2 (13) pp 28-32 (June) (In English, Flemish, & French)

Reports on the following diamond markets : Antwerp, Tel-Aviv, New York, Amsterdam, London, Paris, and Rome. *W* *F.251.321/F.251.3215/F.21.3225/F.251.3235/F.251.324/F.251.342/F.251.351*

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Market reports

S. Emmerik *et al.* *Diamant* 1959 Vol 2 (14) pp 28-32 (July) (In English, Flemish, & French)

Reviews of the following diamond markets : Antwerp, New York, Tel-Aviv, Amsterdam, and Paris.

W *F.251.3215/F.252.3235/F.251.324/F.251.342/F.251.351*

The diamonds of Yakutia

S. Koukharenko. *Diamant* 1959 Vol 2 (13) pp 5-10 (June) (In English, Flemish, & French)

Diamondiferous gravel was found in 1948 along the Siberian Nijniaia Tunguska River, and the first worthwhile deposit was found in 1954. The discovery of the 'Peace Pipe' is recounted. The proportion of gem and high grade industrials is 19.24% in Yakutia, against 3% in the Belgian Congo. 5 illustr.

W *Ebb.12.332*

Antwerp's Street of diamonds

J. D. Radcliff. *Readers' Digest* 1959 Vol 75 (447) pp 44-48 (July)

A general picture of the Antwerp diamond industry, mentioning the uses of industrials, diamond production figures, the Central Selling Organisation, and gem cutting and polishing hazards. Illicit trading and smuggling methods are briefly described. 3 illustr.

W *F.25.3235/F.251.2598.3235*

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND AND OTHER HARD MATERIALS

The origin of healing feathers in gemstones. II. Die Entstehung der Heilungsrisse in Edelsteinen. II

W. F. Eppler. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (7) pp 376-378 (July) (In German)

Three types of healing feather are found in aquamarine : parallel to the principal or 'c' axis of the parent crystal, parallel to the basal plane, and in arbitrary orientations. The first consist of inclusions of liquid which developed during the healing process into long-drawn shapes parallel to the c-axis of the parent. The second is probably caused by a primary crystal inclusion which causes a small feather to form within the parent crystal during the growth of the aquamarine ; these healing feathers appear in a variety of forms. The third type is frequently met, and in most cases is a result of the rapid growth of the parent crystal. (To be cont). 13 illustr.

A *Bb Uz*

High pressure effects on solids

Anon. *Techn News Bull* 1959 Vol 43 (7) pp 138-139 (July)

See *Ind Diamond Abstr* 1959 Vol 16 p A146 (Aug).

W *Bz Vcb*

Production of silicon nitride ceramics and investigation of certain of their properties

I. S. Brokhin, V. F. Funke. *Ogneupory* 1957 Vol 22 (12) pp 562-566 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 747 (June) (Original in Russian)

W *Blz U*

The method of invariants in the optics of transparent nonmagnetic crystals

F. E. Federov. *Soviet Physics—Crystallography* 1958 Vol 3 (1) pp 46-52 (Jan-Feb) (Original in Russian)

5 ref. *W* *Bdz Uk*

On the representation of crystal atoms as symmetrical bodies

S. T. Konobeevskii. *Soviet Physics—Crystallography* 1957 Vol 2 (4) pp 445-453 (July-Aug) (Original in Russian)

This article attempts the further development of a previously published method of calculating atomic x-ray scattering factors for atoms showing anisotropic electron density distributions. The symmetry of the atom must conform to the position that it occupies in the lattice and the configuration of the group of nearest neighbours. Calculation of the anisotropy of the atom shape leads to corrections of the intensities of various interferences. It is shown that in certain cases extinctions are removed and so-called forbidden interferences appear. A method of calculating the anisotropy coefficients from the intensities of the forbidden x-ray interferences is given. The shapes of the atoms show graphically the peculiarities of the chemical bonds in crystals. The carbon atom in diamond is cited as an example of the effect of the coordination and distribution of neighbouring atoms on the symmetry of an atom which is a component unit of a crystal. 5 ref, 1 table.

W *Bd Ub/F Ub*

The development of crystallography in the USSR in the last forty years

Anon. *Soviet Physics—Crystallography* 1957 Vol 2 (5) pp 573-577 (Sep-Oct) (Original in Russian)

W *Vh.132.33*

Dislocations in crystals

V. L. Indenbom. *Soviet Physics—Crystallography* 1958 Vol 3 (1) pp 112-132 (Jan-Feb) (Original in Russian)

A comprehensive review of successful attempts to prove the existence of dislocations in crystals and their role in the processes of growth and plastic deformation. 18 illustr, 111 ref.

W *Bd Ubz/Bd Unkc*

Edge forms and striation on crystals

V. I. Mikeev, I. I. Shafranovskii. *Soviet Physics—Crystallography* 1957 Vol 2 (1) pp 158-162 (Jan-Feb) (Original in Russian)

All the simple edge forms for the lower and middle crystal systems are investigated. Possible types of striations on the crystal faces correspond to these forms. The importance of striae in studying the genesis of crystals is emphasized. The possibility of identifying crystals by their striations is indicated. An illustration shows characteristic striae on crystals of quartz, pyrites, diamond, corundum, chalcopyrite, and arsenopyrites. 6 illustr, 15 ref, 1 table.

W *Bbc Ub/Bcb Ub/Bcz Ub/F Ub*

The disk relief on diamonds and its origin

K. G. Kvokov. *Zap Vses Mineralog Obshch* 1959 Vol 88 (3) pp 240-241 (In Russian)

17 illustr. *W* *F Gz*

X-ray investigations of synthetic stones

K. Lonsdale, H. J. Milledge, E. Nave. *SA Jeweller* etc 1959 Vol 22 (9) p 26 (June)

Investigations have shown that GEC synthetic diamonds always contain single crystal inclusions of nickel or of a Ni-rich face-centred cubic compound, strictly parallel to the surrounding diamond. The Swedish synthetics do not contain nickel, but are generally less well crystallized than GEC specimens. Both show good diffraction spots, and have only occasional traces of graphite.

W *Fh Hz Uklb*

Carbide grade selection. I

W. E. Montgomery. *Carbide Engg* 1959 Vol 11 (7) pp 15-17 (July)

A review of the mechanical and physical properties of carbides, and the influence of the cobalt content. 6 illustr. *W* *Rgz Uc/Rgz Un*

Determination of elastic moduli of sintered metal powder compacts using an ultrasonic method

P. Rama Rao, A. A. Krishnan. *Journ Sci & Ind Res* (India) 1959 Vol 18B (6) pp 260-261 (June)

2 tables, 4 ref. *W* *Bfy Cz Unc*

Ultra high pressure for materials research

C. M. Schwartz, W. B. Wilson. *Battelle Techn Rev* 1959 Vol 8 (6) pp 3-8 (June)

Techniques are described for achieving unusual combinations of extreme pressures and high temperatures. The application of ultra-high pressures in the manufacture of synthetic diamonds is briefly discussed. 4 illustr.

W *B Qc Vcb.131/Fh Ha Vcb.131*

Synthetic diamonds through the microscope

G. A. Tombs. *Australian Gemmologist* 1958 Vol 1 (6) p 12 (Dec); *Journ Gemmol* 1959 Vol 7 (3) p 105 (July)

Reports the examination of some American synthetic diamonds. The size of the crystals was approximately 300/ct, and under 20 × magnification the crystals were seen to be of a typical rough diamond shape and to have the lustre of diamond. Under higher magnification (60 and 250 ×) the pieces were seen to be aggregates of crystals, three or four crystals apparently fused together. Some crystals showed octahedral habit and some dodecahedral. The colour was mostly greyish.

X *Fh Hz Wcm*

The development of the study of crystal forms

I. I. Shafranovskii. *Soviet Physics—Crystallography* 1957 Vol 2 (3) pp 323-329 (May-June) (Original in Russian)

A review of Soviet studies of fine sculpture on the faces of crystals and of the internal structure of crystals. Work on malformed real (non-ideal) crystals which reflect the symmetry of the medium of formation is discussed. Diamond is classified as group $\infty .m$ (ascending or descending feeding solutions directed normal to the floor on which crystals are growing). The highest external symmetry of a crystal in this group is $n.m$; five diamond crystals with outward symmetry $3.m$ are shown. 8 illustr, 30 ref.

W *F Ub.21.33*

The use of the apparatus URS-501 as a single-crystal diffractometer

M. M. Umanskii, D. M. Kheiker, O. S. Volkov. *Soviet Physics—Crystallography* 1958 Vol 3 (1) pp 41-45 (Jan-Feb) (Original in Russian)

5 illustr, 5 ref. *W* *Cz Ukl*

Some diamond problems

R. Webster. *Journ Gemmol* 1959 Vol 7 (3) pp 79-99 (July)

Identification of diamond is comparatively straightforward, but diamonds with anomalous characteristics can give rise to doubt. These characteristics may be due to bad cutting or to unusual colouring. The stone can be identified as a diamond by the presence of naturals on the unpolished edge of the girdle, or by a hardness test. Suspected 'painted' stones may show traces of the dye clinging to the unpolished edge of the girdle. The diamond doublet, in which a non-diamond is crowned with a diamond, can be identified by the reflexion of the edge of the table facet on the cement layer; this appears as a dark shadow edge when the top of the stone is inclined away from the observer towards a source of light. Irradiated green diamonds can be identified as such by leaving the diamond in contact with a bare photographic film or plate in a light-tight box. Developing of the film, or plate, will show a marked blackening of the emulsion. Other methods of identifying treated diamonds or diamond substitutes are explained. 14 illustr, 11 ref.

W *F Hkb*

The Summation of Fourier series by optical methods

V. I. Vlasenko, G. S. Zhdanov. *Soviet Physics—Crystallography* 1958 Vol 3 (2) pp 135-139 (Mar-Apr) (Original in Russian)

4 illustr, 12 ref. *W* *Cz Wc*

DIAMOND, ETC, IN INSTRUMENTS

Jewel bearings

H. P. Chandler, B. A. Brett. US Bur Mines, Minerals Yearbook, Preprint, 1957 3 pp. Price : 5 cents

Domestic consumption, production, and uses of jewel bearings; foreign trade; technology. 5 tables.

W *Tc*

Swiss P 335,599 (July 2, 1956) **A. Peter, Gebr Peter Hole finishing machine for bearing jewels.** Grandiermaschine fuer Lagersteine

The exactly calibrated finishing wire is conically somewhat reduced in diameter towards one end. The wire is wound stepwise on a roll by a device set in operation when the friction between wire and jewels drops below a certain amount, *ie* when the wire reciprocating in the row of jewels has widened the holes so as to have made them ready for being worked by a section of the wire of greater diameter, until the final calibrated wire section is passed through the holes which have then reached the correct diameter. (10 claims, 3 illustr). *J* *Chc Tc:Pz.545*

HARDNESS AND WEAR TESTING

Identifying precious stones. VI. Wir bestimmen Edelsteine. VI

Anon. *Gold & Silber*, etc 1959 Vol 12 (7) pp 19-21 (July) (In German)

The article is concerned with hardness classification and testing. The Mohs hardness scale is given and its disadvantages for accurate work are pointed out. Testing by means of scratching with the ten different Mohs minerals is described, and it is pointed out that variations in brittleness and ease of scratch will be found according to the crystallographic orientation of the specimen. 1 illustr. *A* *Bb Cz*

Investigation of the anisotropy of hardness of single crystals of PbS by scratching

Yu. S. Boiarskaia. *Soviet Physics—Crystallography* 1957 Vol 2 (5) pp 702-705 (Sep-Oct) (Original in Russian)

The PMT-3 microhardness tester, using a 136° diamond pyramid, was used to produce scratches on the (100), (110), and (111) faces of single crystals of PbS. A 5 g load was applied, and the scratching rate was of the order of 0.01 cm/second. Test results are tabulated and described. 4 illustr, 3 tables.

W *Bd Cvdb Wghd:Nde*

Progress in micro-indentation hardness testing

H. Bueckle. *Metallurgical Reviews* 1959 Vol 4 (13) pp 49-100; *BNF Bull* 1959 Vol 39 (360) p 326 (July)

A survey based on 111 references. Definitions; apparatus; theory and variation of hardness with load; relation between load and indentation diameter; technique of measurement; applications.

W *Cv.21*

Measuring decarburization by microhardness

H. Czyzewski, H. H. Honegger. *Metal Progress* 1959 Vol 76 (1) p 93 (July)

A modified method of microhardness testing decarburization depths. 1 illustr. *W* *Cvdb*

Study on the new indentation hardness. I. Proposal of the new hardness

J. Hashimoto. *Metropolitan Techn Coll, Memoirs* 1958 (5) pp 8-16; abstr *Rev of Met Lit* 1959 Vol 16 (2) p 32 (Feb) (In English)

New hardness number, which is determined independently of the magnitude of load and the shape of an indenter, is based on indentation hardness test in comparison with other hardness numbers.

X *Unhc.21*

Instrument for measuring wear on the main journals of diesel locomotive crankshafts

V. A. Solomennikov. *Trudy RIIZHT* 1958 (25) pp 224-230; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 817 (June) (Original in Russian)

W *Pz Unr V*

The reasons for tool wear. Ueber die Ursachen des Werkzeugverschleisses

G. Ostermann. *Ind Anzeig* 1959 Vol 81 (62) pp 983-991 (Aug 4) (In German)

16 illustr, 13 ref. *W* *Pd Unr*

How hard is 'soft'?

Thwing-Albert Inst Co, Philadelphia. *Prod Engg* 1959 Vol 30 (28) p 14 (July 13)

A hardness tester for resinous materials shows penetration and elastic recovery. The indenter is a Vicat type needle. 1 illustr. *W* *Bo Cv*

A new rough surface hardness test for metals based upon full indentation of a ball

G. U. Oppel. *Forschung auf dem Gebiete des Ingenieurwesens* 1950 (5) pp 149-153; *Rev of Met Lit* 1959 Vol 16 (2) p 34 (Feb) (Original in German)

Reliable results are achieved independently of surface condition. Technique permits hardness to be measured by the force required for a ball to make a full indentation to a depth where asperities of the surface do not influence the results.

X *Bf Cvd Unhcz*

TRUING OF GRINDING WHEELS

A 1 : 1 ratio grinding wheel dressing device

R. Whitely. *Tooling* 1959 Vol 13 (7) pp 49-52 (July)

Constructional details are given for a 1 : 1 pantographic wheel forming device which was originally intended for roughing out the form in die parts, form tools, etc, but which, with careful use, can replace an expensive commercial device. Advantages claimed are (*i*) simple and cheap to make; (*ii*) positively matched diamond and stylus; (*iii*) no interference with grinder capacity; (*iv*) eliminates need for removing workpieces from the magnetic chuck during truing; and (*v*) ability to reproduce an existing workpiece or sample. 6 illustr.

W *Nj Psf*

Versatile application of crush form grinding

H. Chase. *Machinery* (NY) 1959 Vol 65 (10) pp 117-120 (June)

The Buick Motor Div crush forms grinding wheels with hardened steel rolls of the required shape. The various applications of crush formed wheels are described. Crusher rolls are ground with a 150 mesh aluminium oxide wheel on a Brown and Sharpe grinder. The wheels are shaped by a diamond held in a pivoted holder. 8 illustr.

W *Ab Cgj Pfe Rw/Agz Chc Pe Rj*

Landis multiple-wheel cylindrical grinder for processing crankshaft bearings

Landis Tool Co, Waynesboro, Pa. *Machinery* (NY) 1959 Vol 65 (10) pp 168-169 (June)

The IWR multiple wheel precision grinder will grind two or more concentric diameters to close tolerances. Operation can be automatic or semi-automatic. Swing sizes of 10 and 14 in., with 30 in. between centres, are available, and a 36 in. wheel can be used on both types. The wheels are trued from individual diamond holders mounted on a sliding table at the front of the grinder, thus ensuring wheel faces parallel to the work centre line. The diamonds can be advanced individually or simultaneously in increments of 0.00005 inch. 2 illustr.

W *Az Chcl Pr:Njd Psf*

Wheel dressing improved with adjustable diamond holder

R. B. Zanardelli, Brescia, Italy. *Am Machinist* 1959 Vol 103 (9) p 127 (May 4)

A new holder for a diamond truer is illustrated. The shaft of a truing tool adapter is retained in a base by two setscrews, and the adapter supports the diamond holder which can be turned to present fresh points to the wheel. The points are produced when a flat is worn on the diamond in any one position. 1 illustr.

W *Mf Nj*

Gamet roller bearing factory

Gamet Products Ltd, Hythe, Colchester. *Machinery* (London) 1959 Vol 95 (2434) pp 56-59 (July 8)

Among the machines in the grinding department are Voumard type 5 and 6 finish grinders with hydraulically operated diamond truing equipment. Wheel truing on the Jones & Shipman grinders can be set to operate at predetermined intervals between 1 and 100 work cycles. 6 illustr.

W *Az Chc Pr:Nj Psfb*

How one plant reduced its truing diamond costs

C. C. Nickerson. *Grits & Grinds* 1956 Vol 47 (11) pp 8-9 (Nov)

A list of eight 'do's' and six 'don'ts' for truing grinding wheels. *W* *Nj.145*

DIAMOND TECHNOLOGY

First published 1942 as "Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.

DAS 1,050,152 (Jan 23, 1957) **J. Looman, Zahnradfabrik Friedrichshafen AG**

Device for truing profiled grinding wheels for grinding helical gear wheels. Geraet zum Abrichten von profilierten Schleifscheiben zum Schleifen von schraegverzahnten Stirnraedern

This is a device for profiling a grinding wheel for grinding helical involute gear wheels, the truing being effected in one pass along the contact line between grinding wheel and tooth flank. Fig 1 shows

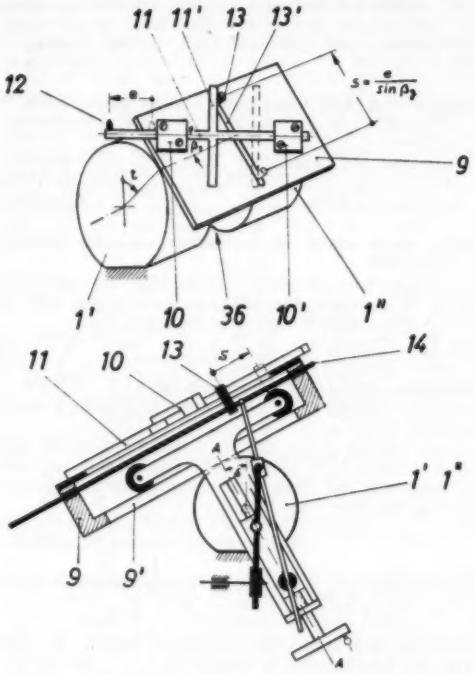

Fig 1 (top). A diagrammatic illustration of the basic arrangement of the truing device.

Fig 2 (below). The rocking gear which is arranged in space 36 of Fig 1. DAS 1,050,152.

diagrammatically the basic arrangement of the truing device. The diamond 12 is shifted on a box like bar 9 rolling over a stationary cylinder 1', 1" of the diameter of the base circle of the gear by a certain amount *e* dependent on rolling angle *t*. This shifting movement is effected by a sliding pin drive with cross rail 11 and pin 13, the rocking gear being arranged in space 36. The rocking gear is shown in Fig 2. The combination of the sliding crank pin drive with the rolling movement of the bar causes the truing tool to be shifted in the direction of the generatrix without using the grinding wheel axis. (6 claims, 7 illustr). Ref cited : 2 DBP.

J *Abmd Cgf Psf.545*

DAS 1,050,224 (Aug 17, 1956) **E. Rotzoll, Herminghausen-Werke GmbH**

Device for compensating the reduction of diameter by truing of grinding wheels of centreless grinders. Einrichtung zum Kompensieren des Abdrehbetrags der Schleifscheiben spitzenloser Schleifmaschinen

Hitherto the reduction of diameter by truing has been compensated by a synchronous feed of diamond tool and grinding wheel carriage. This is not sufficient for precision grinding because of the different radial cutting forces of a blunt grinding wheel and a wheel just trued. In order to correct this inaccuracy, it is suggested that the diamond tool be given a greater feed than the wheel carriage, the feed difference being adjustable. The object may be achieved by starting the feed of the wheel carriage a little later than the feed of the diamond tool ; this can be effected by a suitable coupling of the two feed motors for diamond tool and grinding wheel carriage. It may also be effected by a clutch in the feed gear for the grinding wheel which is let in after an adjustable interval between the start of the diamond feed and that of the grinding wheel. (2 claims, 3 illustr). Ref cited : 1 GP ; 2 USP.

J *Ab Cg Nj:Chcc Pr.545*

FINE BORING AND FINE TURNING

Copper-impregnated powder metal cutting tool holders

Anon. *Engs Digest* 1959 Vol 20 (7) pp 272-273 (July)

W *Psp Rnd*

The study of deformation zones in metal cutting

W. G. Cass. *Tooling* 1959 Vol 13 (7) pp 55-56 (July)

W *Bf Ceg Unk.21*

Effect or errors caused by adjusting pointed cutting tools on the precision of machining

N. I. Fadeev. *Trudy MVTU* 1958 (9) pp 28-41 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 819 (June) (Original in Russian)

W *Ceq Pd.2591*

How fast should it go ?

W. F. Green. *Carbide Engg* 1959 Vol 11 (7) pp 9-14 (July)

An analysis of cutting speeds and feeds, and their influence on 'down time' and production costs per piece. 8 illustr, 3 tables.

W *Ceqb Uqfb|Ceqb Uqff*

Effective method of chip breaking

M. O. Hodelman. *Machines & Tooling* 1959 Vol 30 (4) pp 41-42 (Original in Russian)

Shallow chipbreaker grooves are produced by lapping with a cast iron disk and boron carbide paste. Tool geometry is explained with the aid of diagrams. 2 illustr. *W* *Az Chd Pgbb Rgb Sz*

How far have the new cutting materials progressed ? A che punto sono i nuovi materiali da taglio

S. Leporatti. *Macchine* 1959 Vol 14 (7) pp 693-697, 699, 701 (July) (In Italian)

HSS, tungsten carbide, titanium carbide, titanium boride, ceramics, and other tool materials are compared and discussed. 6 illustr, 3 tables.

M *Pd.132*

Effects of machining forces on tools

R. E. McKee. *Tool Eng* 1959 Vol 43 (1) pp 65-72 (July)

Machining forces affect the machine itself, cutting tools, and jigs and fixtures. Force analysis tests are described, and it is shown how these can be applied to the design of lathes. 9 illustr.

W *Pd Uqg.1312|Pr Uqg.1312|Pu Uqg.1312*

An automatic line for the machining of wrist watch cases
B. S. Andrejev, E. F. Chouchin. *Jemna Mechanika a Optika* 1959 (7) pp 238-240 (In Czech, abstr in English)

The technological process of operations in the machining of wrist watch cases on the first automatic line in a Moscow watch plant; the basic features of its design and performance are described. 3 illustr.
W *Az Ceq Prs.33*

Chrysler report on ceramic tools
B. C. Brosheer. *Metalworking Prodn* 1959 Vol 103 (25) pp 1074-1078 (June 19)

Details of the successful application of ceramic tools are given. Major savings have resulted from increased tool life and improved control over product quality, with little or no increase of cutting speed over those used for carbides. 1 illustr. *W* *Pdd*

Boring machine
Buma Engg Co Ltd, Newcastle-upon-Tyne 6. *Ind Equipt News* 1959 Vol 8 (11) pp 26-27 (June)

The machine is for boring holes in coupling flanges—notably on turbine shafts—where space restrictions require a machine of minimum length. The gear box which drives the boring bar also carries a feed mechanism which, through a bracket sliding on two horizontal bars, imparts a feed to the boring bar. A handwheel is used to position the cutter before boring. The cutters used are tungsten carbide and are sharpened, with jigs supplied, on a metal-bonded diamond wheel. 1 illustr.
A *Alb Bkcb Chc Nv Urc/Az Cfd Pr*

Ceramic—super carbide cutting tools—fact and fiction
T. Metaxas. *Mill & Factory* 1959 pp 113-117 (Mar); *PERA Bull* 1959 Vol 12 (6) p 180 (June)

Comparison of recent results using ceramic and tungsten carbide tools. *X* *Pdc*Pdd*

Stylus guides drill for printed circuit boards
Motion Control Machines, Burbank, Calif. *Design News* 1959 Vol 14 (8) p 8 (Apr 13)

A drilling machine uses a stylus to locate the drilled hole pattern on printed circuit boards to an accuracy of ±0.005 inch. The drill moves up through the boards from beneath the table. Printed circuit boards may be stacked six high under the template and drilled at a rate of 3,000 holes/hour. The cone pointed stylus descends into a 60° countersunk guide hole to locate the parts. A 3,000 lb/sq in. pressure is applied to prevent the stylus from moving and to keep the stack in position. 2 illustr. *A* *Bcb Tdb:Cfb Pr*

Throwaway insert tooling
R. W. Reinhardt. *Tool Eng* 1959 Vol 42 (7) pp 93-101 (June 15)

Some of the ways in which machining costs are reduced with throwaway inserts are outlined. 15 illustr.
W *Pdcb.145*

GF copying lathe with several copying slideways. GF Kopierdrehmaschinen mit mehreren Kopierschlitten
A. Seidel. *Von Werkzeugen & Werkzeugmaschinen* 1959 (16) pp 14-17 (July) (In German)
A *Ceqb Pr*

Tool your automatics with carbides!
E. J. Weller, J. Brophy. *Carbide Engg* 1959 Vol 11 (7) pp 18-19 (July)
2 illustr. *W* *Pdc Prs*

Apparatus for measuring the cutting forces in drilling. Einrichtungen zum Messen der Schnittkraefte beim Bohren
G. Pahlitzsch, G. Spur. *Werkstattstechnik* 1959 Vol 49 (6) pp 302-308 (June) (In German)

The structure and working of instruments for measuring cutting forces are considered. The methods which have been in use up to the present time for measuring cutting forces in drilling are reviewed, and the new methods resulting from the use of expandable measuring strips in the construction of cutting force measuring instruments are described. Special attention is devoted to instruments for measuring feed force, turning momentum, and pressure force during drilling. 12 illustr, 36 ref. *A* *Cfb Uqg V W*

Thread-cutting with single-point carbide tipped tools. La filettatura con utensili monotaglienti a plachetta di carburo
E. Studinger, G. Lichtenauer. *Macchine* 1959 Vol 14 (7) pp 713, 715, 717, 719, 721, 723, 725, 727 (July) (In Italian)
16 illustr, 1 table. *M* *Ceqbd Pdcb*

Cutting tools made of corundum ceramics (microlite TSM-332)
I. I. Tikhonov. *Politekh obuch* 1959 (2) pp 64-73; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 820 (June) (Original in Russian)
W *Pdd*

Calculating drilling torque and thrust
S. R. Uniechowski. *Tool Eng* 1959 Vol 42 (7) pp 117-122 (June 15)

Formulae are given for (*i*) torque; (*ii*) thrust, when drilling brass and aluminium; and (*iii*) thrust, when drilling iron and steel. Five monograms are given for solving the equations. 5 illustr.
W *Bfc Cfb Uqh|Bfd Cfb Uqh|Bfg Cfb Unlg|Bfg Cfb Uqh|Bfxg Cfb Unlg|Bfxg Cfb Uqh*

DAS 1,049,661 T. B. Philip, L. Harvey, Distillers Co Ltd
(Sep 24, Oct 10, Nov 6, Nov 28, 1953; (Feb 4, 1954—conv date, Gt Britain)

Tool for chip producing working of metals. Werkzeug fuer die spanabhebende Bearbeitung von Metallen

One disadvantage of any kind of cooling of a cutting tool, independent of the coolant (cutting oil; carbon dioxide), is the chilling of the chips which harden and cause erosion of the tool tip. This disadvantage can be overcome by enabling the carbon dioxide to expand in a channel within the tool arranged in such a way that the gases do not contact the chips. Such a tool is characterized by a duct leading from the expansion space for the liquid carbon dioxide away from the cutting edge. Fig 3 shows the general arrangement with

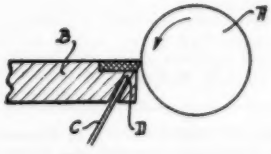

Fig 3. Tube C permits the carbon dioxide to expand in such a way that the gases do not contact the chips. DAS 1,049,661.

workpiece A and lathe tool B with a tungsten carbide tip. The carbon dioxide is admitted through capillary tube C ending a short distance from the cutting edge in wider channel D through which the expanding gas flows into the atmosphere. (6 claims, 11 illustr). Ref cited: 1 GP; 1 FP; 1 USP.
J *Bf Ceq Pdz.545*

DAS 1,051,678 **H. Budgen, NV Philips' Gloeilampenfabrieken**
(Oct 25, 1952—conv date, Netherlands)

Adjustable precision device with tools fixed to two levers opposite each other for the chip producing simultaneous machining of two sides. Einstellbare Praezisionsvorrichtung mit an Zwei einander gegenueber-liebenden Hebeln befestigten Werkzeugen zur spanabhebenden gleichzeitigen Bearbeitung zweier Seiten von Werkstuecken

For the machining of thin workpieces with an accuracy of a few microns, *eg* of thin grinding wheels (0.3 mm) for making grooves in matrices, for producing calibrated disks, etc, certain difficulties are experienced in the arrangements for mounting the (diamond) tools. Normal pivots have to be avoided as inaccuracies develop through play in the bearings. The problem has been solved by (*i*) using an adjustable conical member against which the levers are resiliently pressed; (*ii*) designing the fixed pivot as a leaf spring in a carrier; and (*iii*) making the distance between leaf spring and lever supporting points on the conical member a multiple of the distance between the operative parts of the tool and the leaf spring. Fig 4 is a plan of the

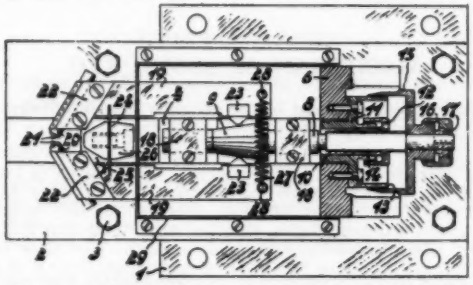

Fig 4. A plan of the arrangement. DAS 1,051,678.

arrangement. The diamonds 21 are mounted in holders 22 on lever 19 which are pressed by spring 27 against conical member 9 adjusted by rings 15 and 16 and nut 17. The rings are so graduated that their divisions form a vernier. 24 is the leaf spring acting as a pivot for the levers. (2 claims, 3 illustr). Ref cited: 1 GP; 1 BP.
J *Ceq Pr Ps.545*

CUTTING AND MACHINING OF GLASS

Grinding the Lick observatory mirror
C. H. Hill. *Grinding & Finishing* 1959 Vol 5 (3) pp 26-27 (July)

The weight of the original glass slab was reduced by 650 lb during grinding to produce a 120 in. mirror. Rough grinding was carried out with 80 mesh silicon carbide and water on a cast-iron lap. This was followed by a sludge of F grade silicon carbide and water, and finish lapping with a sludge of 25 micron garnet and water. Optical rouge (iron oxide) was used on a pitch-coated tool for the polishing operations. 3 illustr.
W *Bm Chc Thb*

Cutting glass
Anon. *Kinomekhanik* 1959 (1) p 45 (Jan); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (2) p 503 (May) (Original in Russian)
W *Bm Ceg*

A versatile lens cutter without formers
Alfred Mills Optical Equipt Ltd, 13-19 Lever Street, Goswell Road, London EC 1. *Mfg Opt* 1959 Vol 12 (8) p 456 (June)

A new lens cutting machine requires no formers yet cuts to any shape. *W* *Bm Ceq Tfb*

Autoflow 200 Mk III spherical generator
Autoflow Engg Ltd, Rugby. *Mfg Opt* 1959 Vol 12 (8) p 456 (June)

Basically similar to the Mark II, the Mark III features a redesigned main casting which gives a greater distance between the work spindle and the diamond tool; a new and wider range of lens holders can be used. The diamond tool is protected by an adjustable plastic tube which is easily replaceable.
W *Bm Chc Nv Tfb*

Kinematics of working parts of grinding and polishing machines for optical parts
V. L. Gorbach. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (2) p 505 (May) (Original in Russian)

Book, Gos izd-vl obor promyshl, Moscow. 1958, 107 pp. [Not in library of Ind Diamond Inf Bur].
W *Bm Chc Pr Tfc/Bm Chm Pr Tfc*

Diamond drills remove concrete
Truco Masonry Drilling Div, Wheel Trueing Tool Co, Detroit, Mich. *Plant Engg* 1959 Vol 13 (5) pp 42, 44 (May)

A reinforced concrete floor 11¼ in. thick, had to have a hole cut, 6 ft 1 in. in diameter, requiring the removal of two tons of concrete. A portable diamond drilling machine with diamond bits was used, with a constant circulation of water at the point of drilling to lubricate the diamond cutting edge and flush away cuttings, also eliminating dust. Drilling time was eight minutes per hole, which meant that the work could be finished in 24 hours, and only two bits were consumed, although heavy reinforcing steel bars had to be cut through in each hole. *A* *Bny Cfb Nh Prw Qr*

Diamond saw. Die Saege mit Diamanten
Anon. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (6) p 330 (June) (In German)

A new and unique instance of the use of diamond in industry has been seen in Varmbol, Katrineholm (Sweden). Thirty-three diamond-impregnated saws were fixed on one holder to cut a block of marble. Each saw blade cost 1250 Kronen. The number of saws will soon be increased to 40.
A *Bnf Ceg Nt*

Diamonds smooth highways
Anon. *Optima* 1959 Vol 9 (2) pp 95-97 (June)

Aircraft runways and highways, with a roughness variation specification of 1/16 in. in 16 linear ft, are smoothed with a surfacing machine using ganged segmental diamond blades. Each machine uses between 90 and 105 blades, or about 2,000 ct of natural diamond grit. The metal-bonded wheels lose only 0.0002 in. from their diameter in an hour's use. A non-skid surface is produced. 4 illustr.
W *Ceqz Pr:Nq Urc*

LITERATURE REQUESTS
When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

DAS 1,050,223 (May 11, 1956) **T. Michaelis, VEB Freiberger Praezisions-mechanik**

Tool for the chip producing machining of a stepped body consisting of annular ribs in particular of a Fresnel lens, and method for its manufacture. Werkzeug zur spangebenden Formung eines aus kreisfoermigen Rippen bestehenden Stufenkoerpers, insbesondere einer Fresnellinse, und ein Verfahren zu seiner Herstellung

The chaser-like tool is composed of a plurality of small steel plates of equal thickness whose working face is shaped to the curved surface of the lens. To produce such a tool, the plates are first clamped in a device in which they rest on a base with the required curvature while the projecting working faces are ground and polished. They are then clamped in a frame with a plane base so that the working faces of the plates project as ribs. Fig 5 and 6 show the plates to be

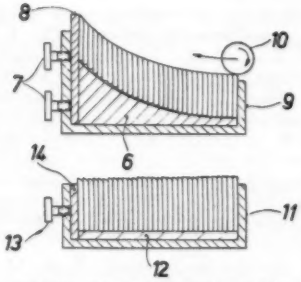

Fig 5 (above) and 6. The plates clamped in their frames. DAS 1,050,223.

ground by wheel 10, and the plates clamped on plane base 12 to be applied to a flat transparent (rotating) blank. (2 claims, 3 illustr). Ref cited : 1 Swiss P ; 1 FP ; 1 USP.

J *Bm Chm Tfb.545/Pdb Qc Tfb.545*

DAS 1,051,607 **R. G. N. Hall, Nat Res Dev Corp** (July 4, 1952—conv date, Gt Britain)

Feeding device for an apparatus for producing helices of great accuracy on a rotating cylinder. Vorschubantrieb fuer ein Geraet zum Herstellen von Schraubenlinien grosser Genauigkeit auf einem umlaufenden Zylinder

Screw threads with *eg* a thousand threads per 25 mm are used in the manufacture of optical diffraction apparatus. The production of such threads includes the preparation of a lead screw and a nut for cutting the final thread. Periodic errors of the lead screw have been eliminated by using nuts with an elastic lining (cork) covering a sufficient number of threads to contain at least one complete cycle of a periodic error in order to reduce inaccuracies in the axial movement of the screw to a minimum. The lead screw however will have not only periodic errors but also progressive errors (slowly changing pitch) which cannot be eliminated by the lead nut. Such progressive errors can be corrected by producing the leading thread of the lead screw in two parts, a short threaded portion of the approximate length of thread of the lead nut and a second threaded portion cut by a tool connected to the lead nut but working in advance of the nut. The arrangement is shown in Fig 7 in which 1 is the short threaded portion of *eg* 25.4 mm in a polished metal cylinder 2 of 300 mm length. The lead nut device is 3, the nut being represented by elastic (cork) lined jaws 4, 5, and 6. Holder 10 balanced by counterweight 11 carries engraving tool 9, arm 13 opposite carries cutter 12. Tool 9 cuts a thread influenced by lead nut 3. Nut 3 moves slowly over the thread 9*a* cut by tool 9. During the movement along 9*a*, cutter 12 cuts a thread 12*a* which is then free of periodic errors as well as of progressive errors. (1 claim, 2 illustr). Ref cited : 1 DBP. *J* *Ceqbd Pr W.545*

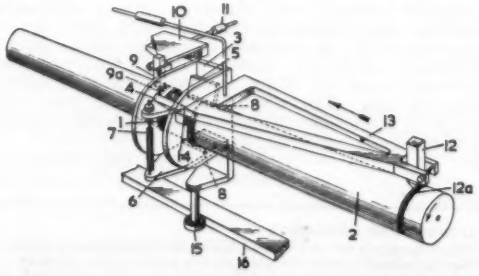

Fig 7. Arrangement of the feeding device. DAS 1,051,607.

MACHINING OF STONE, ETC

Grinding with diamond blades smooths Illinois tollway

Anon. *Civil Engg* 1959 Vol 50 pp 240-241 (Apr)

Con-cut Inc, a California producer of pavement grinding machines, has co-operated with Super-Cut Inc, Illinois diamond blade manufacturers, to develop the Bump Cutter. The machine uses 90 to 105 metal-bonded diamond blades, mounted on a horizontal shaft, for grinding runway and road surfaces. Variations of road flatness up to 7/16 in. high can be ground off at a rate of 10 linear ft/minute. The grinding head is 18 in. wide, giving a grinding area of 15 sq ft/minute. Wear on the diamond blades averages 0.0002 in./grinding hour. The cost of grinding a runway surface was $4,000 ; the only alternative, resurfacing, would have cost $100,000. 3 illustr.

W *Az Chc Nfz Urc:Pr*

Improved results from industrial diamonds

Diamond Res Lab, Johannesburg. *Diamant* 1959 Vol 2 (14) p 15 (July) (In English, Flemish, & French)

A new natural diamond grit for resin-bonded grinding wheels is claimed to be 40% more efficient than previous diamond grits. A new diamond drilling material, prepared to specific shapes and sizes for particular drilling operations, is superior to conventional diamond drill stones.

W *Fc Hk Nh/Kl Nv Urb*

Swiss P 335,592 **W. Osenberg, Bisterfeld & Stolting** (July 3, 1954—conv date, Germany)

Method of making a cutting tool. Verfahren zum Herstellen eines Schneidwerkzeuges

Diamond saws are made by embedding the diamond particles between superposed metal sheets which are welded together by resistance welding whereby limited parts are successively heated and welded. This method permits higher pressures and thus ensures complete embedding of the particles between the sheets. It also permits the production of large cut-off disks without the danger of overheating. The method may be used for other cutting tools as well. The welding may be carried out in vacuo and/or in a protective atmosphere. (7 claims, 5 illustr). *J* *Al Bkc.13.545*

DAS 1,050,264 **H. Schwarzkopf, J. G. van Otterloo, Consolidated Diamond Tool Corp** (July 6, 1955—conv date, USA)

Cutting wheels for cutting abrasive bodies. Schneidscheibe zum Schneiden abreibbarer Koerper

The cutting wheel is provided with cutting bits in the form of annular sections of a sintered mixture of tungsten carbide and nickel or cobalt with diamond powder embedded therein, and is characterized by the use of a mixture of 35 to 55% tungsten carbide and 65 to 45% cobalt or nickel, and by the arrangement of an inner layer free of diamond powder, adjacent to the soldered connexion between cutting section and carrier disk, and an outer cutting layer containing 2 to 6.5% diamond powder. The cutting section is produced by hot pressing the two layers together. It has been found that the life of such wheels is three times that of previous wheels, and that they are suitable for hard materials (silicon carbide; fused aluminium oxide) and/or comparatively soft materials (fire brick; sintered stones). (2 claims, 6 illustr). Ref cited: 1 BP; 1 FP.

J *Bz Ceg Ngb.545/Bz Ceg Pcc.545*

GEM POLISHING

Gemstone grinding practice. Aus der Praxis des Edelsteinschleifens. III

E. Frey. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (7) pp 380-381 (July) (In German)

After the initial rough grinding, finish grinding is performed with aluminium oxide wheels or wooden wheels and aluminium oxide abrasive pastes. 2 illustr, 7 ref.

A *Bb Chct Pe Rj/Bb Chct Pgd Rj Sz*

The origin of diamond cutting in France

E. Sirakian. *Diamant* 1959 Vol 2 (14) pp 26-27 (July) (In English, Flemish, & French)

A very short review covering the 12th to 18th Centuries.

W *F Hl.28.3215.44*

ROCK DRILLING

Diamond drilling—Mount Howden cobalt mine

Anon. *S Aust Dept Mines Min Rev* (Adelaide) 1957 (104) pp 20-21; *IMM Abstr* 1959 Vol 9 (5) p 136 (June-July)

W *Bfu Cfb Nh*

High speed exploration

Diamond Res Lab, Johannesburg. *SA Min & Engg Journ* 1959 Vol 70 Pt 1 (3462) p 1453 (June 19)

A new type of drill crown is capable of faster penetration rates than conventional crowns and penetrates twice the normal distance before having to be replaced.

W *Nhg*

Abrasive wear effects in rotary rock drilling

B. G. Fish, G. A. Guppy, J. T. Ruben. *Inst Min & Met Trans* 1958-1959 Vol 68 (8) pp 357-383 (May)

An investigation of the abrasive wear feature of rotary rock drilling which arises from the high frictional forces developed at the cutting edges. A simple laboratory test of rock abrasiveness has been developed and the results are compared with those obtained in full-scale drilling. The work concerned exclusively cutting edges tipped with hard metal alloys and not diamond drilling tools. 20 illustr, 17 ref, 6 tables.

A *Bn Cfb Pdc Unr*

Diamond core drill

Hermann von Rautenkarnz Internat Tiefbohr KG (ITAG). *World Mining* 1959 Vol 12 (8) p 48 (July)

The machine drills to a maximum depth of 1,000 ft at any angle from vertical, and 1,600 ft horizontally. Hole diameters range from 1¼ to 5 inches. Air drilling or electrical drilling can be done underground, electrical or diesel drilling from the surface.

W *Cfb Nhe Pr*

Research on the influence of physical properties of rocks on drilling rates of diamond drills

Y. Shimomura, A. Takata. *Journ Min Inst Japan* 1958 Vol 74 (844) pp 852-860 (Oct); *IMM Abstr* 1959 Vol 9 (5) p 143 (June-July) (Original in Japanese, abstr in English)

Test diamond core drilling was carried out at the Kamioka mine in Gifu Prefecture. Hardness, compressive, and tensile strength measurements were made on cores. The results indicate that compressive and tensile strength of rock has some effect on drilling rate, but that abrasive hardness is the most important property in relation to drilling rates with impregnated diamond bits.

X *Cfb Nh.1312.373*

Photographs of rock through muddy water in a diamond drill boring

Wimpey Central Lab. *Rock Prod* 1959 Vol 62 (4) p 10

Photographs providing a means of assessing rock conditions where core recovery is poor have been obtained with specially developed equipment. Apart from use in diamond drill holes, the equipment can be used for such underground photography as the complete examination of cavities and abandoned mines met during boring.

A *Bn Cfb Nh.582*

DAS 1,048,848 (July 14, 1954) **Helleborg Bruks AB**

Percussion drill having a hard metal bit with only one cutting edge across the drill head. Schlagbohrer mit Hartmetallschneide mit nur einer sich quer ueber den Bohrerkopf erstreckenden Schneidkante

In all known drills the cutting edge is disposed in the longitudinal centre plane of the bit. As shown in Fig 8, 9, and 10, the cutting edge 9 is arranged laterally of the centre plane *y-y* (longitudinal drill axis *x-x*) at a distance *a*, which is recommended to be approximately 15 to 20% of the width of the bit. This arrangement has the advantage of a self-sharpening action as the portion of the bit to the right when turning the drill clockwise wears more quickly, so that the cutting edge gradually shifts towards the plane *y-y* as indicated by dash-dotted line 16 in Fig 10. Furthermore, the cutting

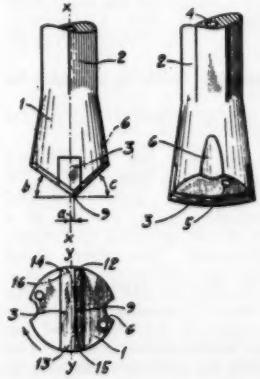

Fig 8 (top left), 9 (top right), and 10. Three views of the drill showing the cutting edge. DAS 1,048,848.

edge on turning the drill always contacts fresh points at the bottom of the hole, and only after a whole revolution is it in the same position as before. The length of holes drilled in quartzite without regrinding could thus be extended to 5 metres. (3 claims, 6 illustr). Ref cited : 1 GP ; 2 DBP ; 1 Swiss P ; 1 FP ; 1 USP ; 2 periodicals ; 1 works pamphlet.
J *Cfbf Pl.1456.545*

GRINDING AND POLISHING OF HARD MATERIALS

600 tests prove superiority of new natural diamond grit
Diamond Res Lab, Johannesburg. *Grinding & Finishing* 1959 Vol 5 (3) pp 10-11 (July) ; *Am Machinist* 1959 Vol 103 (14) pp 74-75 (July 13)

(Advt). Six hundred trials, using 145 diamond wheels, were used to test a new type of diamond grit for use in resin-bonded grinding wheels. An increase of efficiency of 30 to 50% over conventional wheels can be obtained with the new grit. Tests were carried out on three 18 in. Jones & Shipman production grinders with special spindles for operating the wheels at 5,500 surface ft/minute. The wheels were all of the D1A1 type, 6 in. diameter, 3/16 in. face width, and with ¼ in. depth of resin. Each wheel contained 31½ ct of the new grit, and 700 lb of the hardest carbide was ground away during tests.
W *Kl Nv Urb.132*

Honing in the production of small parts. Honen in der Kleinteile-Fertigung
G. Haasis. *TZ f prakt Metallbearb* 1959 Vol 53 (3) pp 89-93 (June) (In German)

Great accuracy is demanded in the production of small parts, and honing is a method particularly suitable for this precision work. Honing small bores is described, all materials from steel and cast-iron to glass and graphite being workable in this way. Diamond-impregnated tools are often necessary to achieve the necessary precision. Horizontal boring machines are used for working small parts both individually and in mass production. The honing tools themselves are described, including diamond tools used especially for honing cast-iron and hardened steel. These tools are made to a diameter of 1.8 mm upwards, and the diamond layer is fixed by an electrolytic process. A plain steel shaft is left either end of the diamond section to permit correct alignment of the tool during work. High cutting speeds are used, and the tools have a long life and preserve their shape well. 13 illustr.
A *Az Chh Nqe/Nqe Qc*

Now you can produce an ultra fine finish on carbides by grinding
W. C. Howard. *Grits & Grinds* 1956 Vol 47 (3) pp 3-4 (Mar)

Finishes of 3 micro-in. and less can be obtained without lapping if finish grinding is done with 1,500 mesh diamond wheels. Sendzimir mill rolls and carbide tube drawing mandrels can be ground to a mirror-finish in a maximum of two grinding operations, *ie* 600 and 1500 mesh diamond. The wheel speed should be low—in the region of 3,500 surface ft/min—and work speed and table traverse should be slow. An important factor is the use of minimum grinding pressure which can be regulated by means of an ammeter connected to the wheel drive motor. The coolant should be water, with the minimum amount of rust inhibitor. 1 illustr.
W *Bkc Chch Nv*

'Microstoning' generates precise finishes
R. Le Grand. *Am Machinist* 1959 Vol 103 (15) pp 96-98 (July 27)

The Supfina Microstoning precision finishing method uses abrasive stones (usually silicon carbide) of up to 1,200 mesh for superfinishing parts to a finish of less than one micro-inch. The equipment is available in two sizes and can be applied to standard machine tools, *eg* lathes and milling machines. It consists of a supporting frame, a head with free-floating piston, an adjustable stone guide assembly on a dovetail slide, and a mounting bar. The free-floating piston inside the head moves in opposition to the body at a frequency in the region of 2,000 oscillations/minute. Final polishing can be done with a diamond paste on a felt-clad wood block clamped in the stone holder. On non-ferrous metals, successful results have been obtained by going directly from a fine-diamond turned surface to finishing with a polishing paste. Diamond finishing of HSS and tungsten carbide can be done with a metal- or ceramic-bonded diamond tool. A cast iron lap-like tool can be used with diamond paste for low production work.
W *Bfdg Chm Nv/Bkc Chm Nv*

The stability of production in machine tools with automatic control. Zur Fertigungsstabilitaet messgesteuerter Werkzeugmaschinen
J. Peklenik. *Ind Anzeig* 1959 Vol 81 (54) pp 839-846 (July 7) (In German)

An introductory paragraph contains a discussion of the change in measurements during grinding. The basic structure of an automatic control device is described, and details are given concerning the factors which influence stability of production. The following systematic faults influence the stability in an automatic control machine : tool wear ; elastic and thermal deformation of the machine, workpiece, and tool ; systematic failure in the measuring apparatus, the setting up and the switching off, etc ; faults which are made inevitable by the arrangement of the measuring instruments. Each of these factors is examined. Under tool wear, the wear of the diamond truing device must be taken into account as well as that of the grinding wheel. The technical criteria for the construction of automatic control are discussed. 24 illustr, 7 ref.
A *Pr V Wp*

Recent advances in grinding wheels
C. Soderlund. *Grits & Grinds* 1956 Vol 47 (8) pp 3-9 (Aug) ; (10) pp 3-5 (Oct) ; (11) pp 10-14 (Nov) ; 1957 Vol 48 (1) pp 3-4, 15 (Jan)

The most important advance has been the better understanding of the grinding wheel and its working action. Grinding is a chip producing operation, and the abrasive grains which produce the chips are considerably influenced by the truing operation. The effect of diamond truing is discussed, and special truing set-ups are described. Abrasives, bonds, wheel speeds, and types of wheel wear are covered. Other factors considered are segment chucks, geometry of grain paths, average grain depth of cut, wheel balance, and vibration analysis. 13 illustr, 1 table.
W *Ab Cg Nj/Nv.21/Pr.21*

External honing device. Utensile levigatore per esterni
Anon. *Macchine* 1959 Vol 14 (8) p 795 (Aug) (In Italian)

The abrasives used in this device are silicon carbide for non-ferrous materials and aluminium oxide for all kinds of steel. 2 illustr.
M *Bfd Chh Rj/Bff Chh Rgc*

Grinding milling cutters. Schleifen von Fraeswerkzeugen
Anon. *Technik & Betrieb* 1959 Vol 11 (7) yellow insert pages (July) (In German)

(Cont). Correct angles of workpiece and wheel, and appropriate set-up of the workpiece are described briefly. Sintered carbide milling cutters should be ground by silicon carbide and diamond, the diamond wheels only being applied when the rough grinding has reached a certain point in the correct shaping of the workpiece. 7 illustr.
A *Alc Bkc Chc Nv/Alc Bkc Chc Pe Rgc*

Diamond wheels in Japan
Anon. *SA Jeweller* etc 1959 Vol 22 (9) p 27 (June)

The names and addresses of seven Japanese diamond grinding wheel manufacturers are given, together with the name and address of the Japanese Industrial Diamond Association. *W* *Nv.241.373*

Diamond wheels
Australian Abrasives Pty Ltd, Auburn, NSW. *Commonwealth Eng* 1959 Vol 46 (9) pp 93-94 (Apr 6)

A new resinoid bond, B 16, has been developed and found to reduce diamond wheel wear in grinding carbide tipped tools without a coolant. It is claimed to grind as freely as other dry grinding bonds without overheating, and is available in the full range of AA resinoid bond diamond wheels.
A *Al Bkc Chc Nv Urb*

The work goes on at Diamond Research
Diamond Res Lab, Johannesburg. *SA Min & Engg Journ* 1959 Vol 70 Pt 1 (3463) p 1539 (June 26)

A new natural diamond grit for resin-bonded diamond wheels is 40% more efficient than the grit previously used. Drill crowns set with the new material have a penetration rate 60% greater than the old type, and will drill 80% further. 2 illustr.
W *Kl Nhg/Kl Nv Urb*

Improved natural diamond grit
Diamond Res Lab, Johannesburg. *Machinery* (London) 1959 Vol 95 (2433) p 27 (July 1)

An improved form of natural diamond grit for use in resin-bonded grinding wheels increases wheel efficiency by as much as 40%. The new grit consists of friable, irregularly shaped particles which wear down gradually, leaving the bulk of each particle firmly embedded in the bond. *W* *Kl Nv Urb*

Grinding low-module gears with abrasive worms
V. P. Efimov. *Trudy MVTU* 1958 (90) pp 85-109; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 785 (June) (Original in Russian)
W *Ad Chc Pez*

Polishing brushes designed for use with diamond compounds
Engis Equipment Co, Hyprez Div, 431 South Dearborn St, Chicago 5, Ill. *Mod Machine Shop* 1959 Vol 32 (2) p 202 (July); *Grinding & Finishing* 1959 Vol 5 (3) p 48 (July)

Fine, natural stiff bristle is used in the manufacture of a new range of polishing brushes for use with diamond compounds. *W* *Chm Kmg Pv*

Razor blade production at Gillette
Gillette Industries, Isleworth. *Times Rev of Ind* 1959 Vol 13 (150) p 55 (July)

The process is described from materials testing, through etching, polishing, and honing, to packing. 3 illustr. *W* *Az Cz/Tz.13*

Grinding spherical end faces
B. A. Goncharov. *Mashinostroitel'* 1959 (3) pp 17-18; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 790 (June) (Original in Russian)
W *Alc Chc*

Feed rate of centreless grinders
T. G. Hicks. *Metalworking Prodn* 1959 Vol 103 (31) p 1199 (July 31)

A nomogram is given, based on the equation $F = \pi d N \sin\alpha$, where F = work feed, d = control wheel diameter, N = control wheel speeds, and α = control wheel inclination. 1 illustr.
W *Chcc Pd Uqff*

Finishing parts using abrasive tools
G. B. Lur'e. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 790 (June) (Original in Russian)

Book, Vses uchebno-pedagog izd-vo Trudrezerv-izdat, Moscow. 1958, 122 pp. [Not in library of Ind Diamond Inf Bur]. *W* *Az Chm Pe.52*

Oblique angle grinding and advantages derived from its use. La rettifica a tuffo obliquo ed i vantaggi derivanti dal suo impiego
M. Nogaro. *Macchine* 1959 Vol 14 (8) pp 779, 781, 783, 787 (Aug) (In Italian)

Comparison between straight and oblique angle grinding using diamond wheels. 15 illustr.
M *Chc Nv*Chcz Nv*

A.I.T.'s diamond wheel carbide grinding clinic
E. W. Pennington. *Tooling & Prodn* 1959 Vol 25 (4) pp 60, 62 (July)

The AIT Diamond Tool Co has a diamond grinding 'clinic' to which manufacturers can take their grinding problems. This facility will be extended on completion of new premises. 3 illustr.
W *Bkc Chc Nv.1313*

Grinding wheels with cooling
V. N. Ustinov, A. Yu. Kuz'min, A. A. Rakov. *Mashinostroitel'* 1959 (3) p 32 (Mar); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 790 (June) (Original in Russian)
W *Pe Qs*

Automatic dimensional control on centreless grinding machines. Automatische Messteuerung an spitzenlosen Schleifmaschinen
E. Rotzoll. *Ind Anzeig* 1959 Vol 81 (54) pp 831-838 (July 7) (In German)

By means of automatic control, compensation can be made for changes in the shape and size of the workpiece during grinding operations. The methods of working with such a control device and the results obtained are described in detail. The process entails measuring the wheel to find out how much wear has occurred. This may be done either by means of a pneumatic set up or by a diamond stylus. The workpiece is also measured and its shape taken into account by the same method. 20 illustr.
A *Chcc Pr Wp*

Power, pressure and rate of cut in precision grinding
H. W. Wagner. *Grits & Grinds* 1956 Vol 47 (3) pp 5-7 pp 10-13 (Mar)

Horsepower requirements of a motor for a given rate of stock removal, or maximum rate of cut for power available, is computable by formula. 3 illustr, 3 tables.
W *Chcz.21*

Selecting the right grinding wheel

E. T. Larson. *Grits & Grinds* 1956 Vol 47 (11) pp 3-7 (Nov)

The six factors considered are (*i*) material to be ground and its hardness; (*ii*) amount of stock to be removed and finish required; (*iii*) whether grinding wet or dry; (*iv*) wheel speed; (*v*) area of grinding contact; and (*vi*) severity of the grinding operation. The recommendations made are for varieties of Crystolon or Alundum wheels. 1 illustr.

W *Pe.18*

Diamond Research Laboratory announces lab results on improved diamond grit

R. G. Weavind (Diamond Res Lab). *Grinding & Finishing* 1959 Vol 5 (3) p 56 (July)

Selected natural diamond boart, a Diamond Research Laboratory development, improves resin-bonded wheel efficiency by as much as 40%. 1 illustr.

W *Kl Nv Urb.132*

Improved natural diamond grit for resin-bonded grinding wheels

R. G. Weavind (Diamond Res Lab). *Diamond News* etc 1959 Vol 22 (9) p 25 (June)

A natural diamond grit developed recently gives up to 40% greater efficiency for resin-bonded grinding wheels. The grit is friable and rough surfaced, and is retained in the bond until expended.

W *Kl Nv Urb*

In 90-second fiery blast

R. J. Westerholm. *Grits & Grinds* 1959 Vol 50 (4) pp 3-7, 10-12 (Apr)

Rokide 'Z' zirconium oxide coatings are applied to aviation engines as protection against hot exhausts and erosion. Silicon carbide wheels are recommended for grinding; diamond wheels can be used but are not necessary. 7 illustr, 1 table.

W *Az Cz Rmp*

DBP 971,204 (Jan 28, 1944) **J. Dorfner, F. Dorfner**

Metal-bonded abrasive body. Metallgebundener Schleifkoerper

Porous mineral grains (pumice, fired clay, or other ceramic materials) are embedded in the metal bond. It is thought that the method is of special advantage for diamond wheels as it reduces the wear by improving the cooling. (4 claims). Ref cited: 5 GP; 1 Austrian P; 1 FP; 1 BP; 5 USP.

J *Pe Urc.545*

DAS 1,049,267 (May 13, 1957) **W. Osenberg**

Peripheral grinding wheel. Umfangsscheibe

Known wheels, composed of *eg* thin disks at fixed distances from each other (for chip removal) on a common hub, have the disadvantage that parts of the thin disks easily break off. Other such designs also show disadvantages such as too narrow channels for chip removal which make them almost useless, so that rapid grinding cannot be achieved. The problem has been solved by gluing between the individual thin grinding disks box shaped hollow profiled bodies as distance pieces so as to form spokes between the disks. These distance pieces may also be provided in the form of annular corrugated or honeycomb-like pressed plates, or the individual grinding disks may have radially projecting ribs for gluing adjacent disks together. The ribs and the disks may have tooth-like projections meshing with each other to ensure a safe connexion between adjacent disks and distance pieces. (4 claims, 7 illustr). Ref cited: 2 GP; 1 Swiss P; 1 BP; 2 FP.

J *Pe.545*

DAS 1,049,268 (June 4, 1957) **W. Osenberg**

Face grinding wheel. Stirnschleifscheibe

The wheel is built up of ceramic- or resin-bonded thin walled grinding annuli, or parts of such annuli, on a carrier disk, and of softer, easily abraded bodies between the grinding rings in the shape of axially arranged metallic or non-metallic box-like hollow profiled pieces glued to the grinding parts. The profiled pieces may be replaced by a body of foamed plastics or a porous ceramic material in which the abrasive parts are embedded. In order to ensure good connexion between the abrading portions and the non-abrading portions the grinding rings or ring parts may be provided with radial projections in an axial direction. The grinding portions may be arranged in concentric

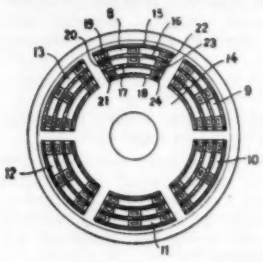

Fig 11. The grinding wheel showing the concentric grinding rings. DAS 1,049268.

rings as shown in Fig 11 in which the portions 15, 16, 17, and 18 are combined to ring part 8 of the six parts 8 to 13 on carrier disk 14, spaced by hollow profiled pieces 19 to 14. (4 claims, 5 illustr). Ref cited: 2 DBP; 1 GP; 2 Swiss P; 1 FP; 3 BP; 5 USP.

J *Pe Qc.545*

DAS 1,050,222 (Sep 14, 1957) **K. H. Schultze, Herbert Lindner GmbH**

Feeding device on thread grinding machines. Beistellvorrichtung an Gewindeschleifmaschinen

The handwheel for feeding the grinding wheel towards the workpiece or towards the truing device is provided with two graduated rings and two stops. The two rings are independently adjustable on the handwheel and their graduations are numbered in opposite directions so that the zero position is always fixed in advance and need not be calculated. (3 claims, 5 illustr).

J *Chc Pr Psf.545*

DAS 1,050,225 (Aug 12, 1954) **W. Osenberg**

Face grinding wheel. Stirnschleifscheibe

In known segmental grinding wheels the ratio between the width of the abrasive portions and the non-abrasive portions for chip removal is not adequate and the abrasive portions become rapidly clogged. This is remedied by mounting on a fibrous carrier disk thin-walled grinding annuli in concentric arrangement. The thickness of the annulus in relation to its diameter should be of 1 : 40 to 1 : 60. The annuli are produced from resin-impregnated layers of fibrous webs in which the abrasive grains are embedded. Tests have shown that rotational speeds of 90m/sec could easily be reached, and 1 g of abrasive could remove 16 g of the material to be ground. In ceramic-bonded wheels the ratio would be in the range of 1 : 5. (4 claims, 7 illustr). Ref cited: 1 Austrian P; 5 USP, in particular 2,335,902 and 2,520,763.

J *Pe.545*

LITERATURE REQUESTS

Please quote the page number of the journal which contains the original reference, and the author and title of the article, in all cases.

DAS 1,050,683 (Dec 6, 1957) **R. Engel, E. Becker, Telefunken GmbH**

Device for supplying predetermined quantities of a mixture of a liquid and a finely granular substance (add DBP 1,005,403). Vorrichtung zur Abgabe dosier-barer Mengen eines Gemisches aus einer Fluessigkeit und einer feinkoernigen festen Substanz

The main Patent describes a device for supplying a mixture of oil and finely divided abrasive using a rotary hollow body in the container which, to prevent the separation of the mixture, includes a mixing blade and a receiving channel. The inclination of the axis of rotation of the body is adjusted to the required quantity. A drawback of the design is the possibility of a part of the granular substance settling at the bottom of the hollow body during stationary periods. This has been overcome by temporarily changing the inclination of the hollow body without stopping rotation, so that the drops of the mixture fall back into the interior of the body. (3 claims, 1 illustr).

J *Chd.545*

DAS 1,051,156 **S. A. Boettcher, Crane Packing Co** (Mar 29, 1954—conv date, USA)

Lapping machine. Laeppmaschine

The design is intended to simplify the arrangement of truing rings. One earlier design, for instance, used a central gear for driving the truing rings. Counter bearings prevented the rings from turning with the lapping wheel. A simpler drive consists in a central friction roll contacting the truing rings and rotating in the opposite direction to the rotation of the lapping wheel while each truing ring is kept from rotating with the lapping wheel by a freely rotating roller arranged as a counter bearing outside. (1 claim). 1 GP ; 1 DBP ; 1 USP.

J *Chd Pr.545*

DAS 1,051,683 (July 28, 1953) **W. Osenberg**

Method of making resin-bonded grinding bodies. Verfahren zum Herstellen kunstharzgebundener Schleif-koerper

The abrasive in the mould is first compacted by vibration and pressure, then the liquid resin is injected through nozzles into the mould provided with exhaust channels so as to fill the empty spaces between the skeleton formed by the abrasive particles. The resin is hardened by heating the mould and part of the resin may be removed before the hardening step by injecting a gas through the nozzles, or by suction or centrifugal force. (5 claims, 5 illustr). Ref cited : 1 DBP ; 3 GP ; 2 Austrian P ; 2 FP ; 4 BP ; 2 USP.

J *Nv Urb.545|Pe Urb.545*

DAS 1,051,679 (May 10, 1954) **O. H. Schuetze**

Method and device for preventing the formation of smoke when grinding metallic workpieces. Verfahren und Vorrichtung zur Verhinderung der Qualmbildung beim Schleifen metallischer Werkstuecke

The development of smoke by the burning of heated particles can be prevented by the injection of an oxygen free fluid into the space below the point of contact between grinding wheel and workpiece so that the fluid completely fills the space. The nozzles are to be arranged as near as possible to this point at a small inclination to the tangent and opposite to the grinding direction. (2 claims, 1 illustr).

J *Bf Chc Vb.545*

NEW MACHINING METHODS

Japanese electro-erosion machines. Macchine ad elettro-erosione di produzione giapponese

Anon. *Macchine* 1959 Vol 14 (7) p 727 (July) (In Italian)

M *Ceqn Pr.373*

Building rocket engines for the country's defense

C. O. Herb. *Machinery* (NY) 1959 Vol 65 (11) pp 122-129 (July)

Carbide tools are sharpened on a Hammond cutter grinder used with an Anocut electrolytic unit. A 12 in. diameter peripheral diamond grinding wheel is used. Electrolytic grinding has extended diamond wheel life by a factor of eight.

W *Al Bkc Chcr Nv Pr|Chcr Nv*

Is Russia widening the ' spark ' gap ?

S. C. Ratmansky. *Am Machinist* 1959 Vol 103 (15) pp 92-93 (July 27)

A detailed analysis of a Russian spark discharge machine, its circuit, design, and operation. The machine removes ¼ cu in. hardened steel/min with 28 kw power. 2 illustr.

W *Ceqm Pr.33*

Ultrasonic machining of hard and brittle metals

L. D. Rozenberg, D. F. Yakhimovich. *Vest mash* 1959 Vol 39 (2) pp 51-55 (Feb) ; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 820 (June) (Original in Russian)

W *Bfz Ceqr*

Producing small carbide saws by electrolytic grinding

Martindale Electr Co, Cleveland, Ohio. *Carbide Engg* 1959 Vol 11 (6) pp 27-28 (June)

Tungsten carbide saws with diameters from ¼ to 1 in., and from 0.015 to 0.045 in. thick, are produced to a normal tolerance of 0.0005 inch. The teeth are cut electrolytically, using an Anocut power unit and diamond grinding wheels. 3 illustr.

W *Az Bkc Chcr Nv*

Swiss P 335,078 **R. M. M. Dousset, SERPMI Soc d'Etude de Réalisation de Produits Matériels Industriels (Sàrl)** (Jan 20, 1956—conv date, France)

Method of machining workpieces by removing material by means of a tool. Procédé d'usinage de pièces par enlèvement de matière à l'aide d'un outil

A process for machining a workpiece, in which material is removed by means of a tool and a lubricating material inserted between the workpiece and the tool, this material being a solid matter with a fusion point lower than that of the material to be machined and with a higher surface tension. The material is such that the pressure exerted by the tool on the workpiece causes the material to melt, and reduces it to a film of a thickness less than 3 molecular layers, without the film's being broken. (6 claims).

J *Bf Ceq.545|Bl Ceq.545*

IDR REPRINT SERVICE

The following Reprints are now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1, at a charge of 1s each, post free :

C 98—The resistance of diamond to abrasion, by E. M. Wilks and J. Wilks (*Phil Mag* 1959).

I 252—A new method of determining the average shape of diamond and other particles, by J. F. H. Custers and F. A. Raal ; A counting device for diamonds, by F. A. Raal, (*IDR* 1959).

Swiss P 335,207 **G. F. Keeleric, Boart Products South Africa Ltd**
(Sept 21, 1953—conv date, USA)

Electrolytic grinding device. Elektrolytische Schleifeinrichtung

The diamond wheel grinding of hard materials such as titanium carbide as used for turbine blades in jet engines is slow and expensive. Reducing grinding time by increased pressure leads to greater tool wear and still higher costs. Electrolytic grinding reduces the time by a combination of electrolytic and abrasive action and also reduces tool wear. In the case of a scarcity of diamond powder electrolytic action may be used almost exclusively but only by reducing the cutting speed accordingly. It has been found that by controlling the electric current in dependence on the electric resistance encountered at the line of contact between electrode and tool so that the voltage of the current always remains within narrow adjustable limits, the problem of achieving the best division between electrolytic removal of material and removal by grinding could be solved. The current passing the grinding electrode and the workpiece is measured by a device including an amplifier whose output controls the current supply. The electron valve or valves are a thyratron or a plasmatron. (14 claims, 4 illustr).
J *Bk Ceqh.545*

DBP 971,051 (Jan 4, 1944) **R. Farines**

Device for making holes in synthetic jewels made of hard dielectric materials. Vorrichtung zum Lochen von aus hartem dielektrischem Werkstoff bestehenden synthetischen Edelsteinen (Lagersteinen)

Bearing jewels for watch movements and other instruments have hitherto been drilled by mechanical means using diamond powder as the abrasive. The procedure requires specially sensitive tools and substantial skill. Electrolytic drilling and electric spark discharge methods have been used, and also corpuscular rays. The time for drilling a hole varied between 10 sec and several minutes per hole. The new method permits a hole to be made automatically in a fraction of a second. The jewel *r* as shown diagrammatically in Fig 12, is placed between two electrodes *e* in a non-conductive carrier plate d_2. Another non-conductive

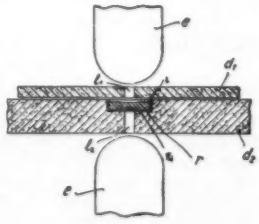

Fig 12. The jewel placed between two electrodes. DBP 971,051.

plate d_1 is placed over the jewel. Both plates d_1 and d_2 consist of a highly dielectric material and are provided with central air channels l_1 and l_2, whose axes coincide with the central axis of jewel *r*. A high tension current is passed through the electrodes and the resultant ionising of the air in channels l_1 and l_2 directs the spark discharge centrally through the jewel which may also be coated all round with an insulating paste. The jewels may be arranged on a conveyor continuously passing the stones between the electrodes with automatic discharge when in position. (3 claims, 3 illustr). Ref cited: 1 GP; 5 DBP; 2 BP; 3 USP; 1 FP; 5 periodicals; 2 books.
J *Bbb Cfb Tc.545*

POWDER TECHNOLOGY

Recommendations for changes in CS 123-49 Commercial Standard in grading of diamond powders

Diamond Powder & Compounds Committee. *IDA News Member Letter* 1959 (243) Att No I (July 24)

Five changes in Commercial Standard CS 123-49 (Grading of Diamond Powders) are recommended; the changes are limited to micron sizes.
W *Hve Km.255*

Particle size analysis by means of a sedimentation balance system. Korngroessenanalysen mit der Sedimentationswaage

W. Friedrich. *Staub* 1959 Vol 19 (8) pp 281-287 (Aug 1) (In German)

8 illustr, 15 ref, 2 tables. *A* *Vgf*

TOOL PRODUCTION

DAS 1,049,290 **L. J. Frost, National Lead Co**
(Aug 30, 1954—conv date, USA)

Abrasive of great hardness, and method for its manufacture. Schleifmittel von grosser Haerte und Verfahren zu ihrer Herstellung

It has been found that the hardness of titanium carbide can be used in combination with aluminium oxide for the production of a valuable abrasive by embedding finely divided crystals of titanium carbide in a matrix of crystalline α-aluminium oxide. The hard titanium carbide crystals enable rapid cutting of certain materials while the rather hard α-aluminium oxide contributes toughness. Between 10 and 50% of the total weight should be titanium carbide particles of a size between 20 and 5 micron. The method of manufacture consists in melting aluminium oxide and titanium oxide or other titanium containing materials (rutile; ilmenite) in the presence of a reducing agent such as coke. In a product of 90% aluminium oxide and 10% titanium carbide the hardness of the TiC-phase was 3,000 measured with a microhardness tester with a diamond pyramid at a load of 100 *g*, and the hardness of the Al_2O_3-phase was 1,525. (5 claims). Ref cited: BP 574,843; USP 2,090,274.
J *Qc Rd.545*

DAS 1,051,011 **E. Lowe, Deutsche Norton GmbH**
(Oct 16, 1951—conv date, USA)

Hard material produced by powder metallurgical method from aluminium containing boron carbide, and method for its manufacture and the manufacture of articles from it. Pulvermetallurgisch hergestellter Hartstoff aus aluminiumhaltigem Borkarbid sowie Verfahren zu dessen Herstellung und zur Herstellung von Gegenstaenden aus ihm

The hard material consists of 2 to 5% free aluminium, up to 2% Al_2O_3, up to 1% other impurities, and boron carbide in a form between B3.8C and B5.4C. The mixture of boron carbide and aluminium powder is heated in a graphite mould under a pressure of at least 35 kg/sq cm to 1,800 to 1,900 deg Centigrade. The resultant solid block is then ground in a ball mill to obtain particles of not more than 15 microns, and its composition, if necessary, is corrected by admixing free boron carbide. The average breaking stress was 4,000 kg/sq cm, at a content of 2.5 Al; at 3.0 Al, 3,720 kg/sq cm; at 4.0 Al, 3,250 kg/sq centimetre. (3 claims). Ref cited: 3 GP; 1 book.
J *Bfy Rgb W.13.545/Bfy Rgb.13.545*

SURFACE FINISH TESTING

Flatness within millionth . . . in production

Anon. *Am Machinist* 1959 Vol 103 (13) pp 79-80 (June 29)

Buick water pump impellers are honed to a surface finish of 10 to 20 micro-in. on Gisholt 81 superfinishing machines. Examination of 3% of production is carried out with optical flats and monochromatic light. 2 illustr. *W* *Az Chh Pr Unf*

Surface Irregularity Tester

Am Res & Mfg Corp, Rockville, Md. *Engs Digest* 1959 Vol 20 (7) p A8 (July)

A new non-destructive waviness measuring instrument, for testing the flatness of mica, displays results as index numbers of waviness or calibrated in suitable units, *eg* the radius of curvature of a defect.
W *Bcz Wgf*

Indicating surface flatness with electronics

P. E. Carbone. *Tool Eng* 1959 Vol 43 (1) pp 57-58 (July) 2 illustr. *W* *Cz Unf We*

The slope of the bearing area as a measure of the surface texture

M. Ehrenreich. *Microtecnic* 1959 Vol 13 (2) pp 93-98 (Apr) (In English)

In the course of research on the reboring of internal combustion engine cylinders, it was shown that the usual Talysurf surface roughness values did not provide a complete record of the surface finish. A method is described whereby the bearing area curves of Abbott and Firestone were analyzed in a new way, different from that of Howard and Tuplin. 14 illustr.
W *Ag Cx Unf*

MISCELLANEOUS

Precida [Precidia], specialists in diamond tools. Precida, le spécialiste de l'outillage diamanté

SA Precida. *Rev Gen Mécan—Electricité* 1959 Vol 43 (123) p 80 (June) (In French)

(Advt). This company supplies the SNECMA with the diamond tools required in manufacturing aeroplane engines. Truing tools are manufactured with whole diamonds or impregnated with diamond dust. Cutting tools, truing tools for drawing dies, hardness testers, grinding wheels of all shapes and sizes, and lapping tools, are all produced by this firm. Advances have been made in the field of resin-bonded wheels, which are gradually taking the place of metallic bonds, and in that of 'LS' sintered diamond particle tools for truing, grooving, and profiling.
A *Az Ceq N*

Electronics in machine tool automation. L'elettronica nell'automazione delle macchine utensili

Anon. *Macchine* 1959 Vol 14 (8) pp 797-807 (Aug) (In Italian)

M *Ceqh Pr.133*

The industrial diamond in modern history

A. Goldmuntz. *Diamant* 1959 Vol 2 (14) pp 19-25 (July) (In English, Flemish, & French)

A non-technical review of the industrial uses of diamond, quoting production and consumption statistics. The competition from synthetic diamonds is considered. *W* *Fc*Fh/Fc.46*

The mystery of two diamond polishing pictures

P. Grodzinski. *Gemmologist* 1959 Vol 28 (335) pp 102-104 (June)

2 illustr. *W* *Fb Hp*

PUBLICATIONS RECEIVED

BOOK REVIEWS

The Diamond Industry in 1957-1958

A. Moyar. Vlaams Economisch Verbond, Schoenmarkt 31/VII (Tower Bldg), Antwerp. 1959, 131 pp, illustr. Price: 15s (Copies available in French, Dutch, and English)

This latest work by A. Moyar is intended to be read in conjunction with the previous volume [*Ind Diamond Abstr* 1958 Vol 15 p A93 (June)] which paid detailed attention to the geographical and historical aspects of the diamond fields, the diamond cutting industry, and the organization of the trade. The contents cover production (by country of origin), trade, the cutting industry, and industrials.

Industrials accounted for 80% of total diamond production in 1957, and a table shows the total of industrials produced in 1956 (by country of origin) and the percentage of industrials in relation to the total diamond production of each country. The table also compares the industrial production figures of 1956 and 1957. World sales figures are given for the years 1953 to the first three months of 1959. Recent activities in various countries' diamond tool industries are summarized; the only newcomer to diamond tool production is Southern Rhodesia, where a diamond drill factory was recently opened at Salisbury.

The Gen Electr Co's synthetic diamond is dealt with fairly briefly. Laboratory experiments have shown that synthetics are unsuitable for (*i*) metal-bonded wheels; (*ii*) diamond saws; (*iii*) cutting and polishing of diamonds; and (*iv*) glass polishing.

Activities in the diamond fields of the USSR are described, and it is mentioned that experiments have been carried out to determine the suitability of Siberian diamonds for exploratory drilling [*Ind Diamond Abstr* 1958 Vol 15 p A141 (Sep)].

Moyar's annual reviews serve a unique purpose in that they fully and fairly summarize a complicated industry. They deserve a place in the library of the diamond tool manufacturer, the geologist, the crystallographer, and the economist.
W *F.25.532*

Tool Engineer suppliers directory issue

ASTE, 10700 Puritan Ave, Detroit 38, Mich. *Tool Eng* 1959 Vol 42 (7) 600 pp (June 15)

The suppliers directory issue lists products, manufacturers, and sales offices of interest to the tool engineer. Diamond tools are included. Each section is printed on a distinctively coloured paper for ease of reference, and the directory appears to give full coverage to US manufacturers, and also touches on Canadian manufacturers.
W *N.56/P.56*

TRADE LITERATURE

The art of Blanchard surface grinding

The Blanchard Machine Co, 64 State St, Cambridge 39, Mass. 45 pp, 5½ × 7½ in., illustr

Principally devoted to choosing the right wheel for the job and using the correct operating procedure, but also lists a range of Blanchard surface grinders. Diamond wheels are recommended for use on quartz, natural corundum, hard ceramics, and synthetic sapphire. The booklet is well illustrated and is recommended to all users of surface grinders—whether Blanchard or otherwise—as the wheel selection examples will serve as a comparative measure of the performance of installed grinders.

W *Chcm Pr:Nv.57*

The inside story of the men, the machines and the methods that have made Blanchard grinding wheels famous for quality

The Blanchard Machine Co, 64 State St, Cambridge 39, Mass. 4 pp, 8½ × 11 in., illustr

Describes and illustrates the manufacture of grinding wheels, from supply of abrasives, through batching, mixing, pressing, ovens, kilns, truing, grading and inspecting, balancing, speed testing, and bonding.

W *Pe Qc.57*

About silicon carbide

The Carborundum Co Ltd, Trafford Park, Manchester 17. 10 pp, 5½ × 8½ in., illustr

The history, properties, uses, grades, and mesh sizes of silicon carbide are described. Silicon carbide was discovered in 1891 by Dr E. G. Acheson, the founder of the Carborundum organisation.

W *Rgc.57*

Grinding cemented [sintered] carbides

The Carborundum Co Ltd, Trafford Park, Manchester 17. 12 pp, 5½ × 8½ in., illustr

Although described as a 'brief' guide to successful carbide grinding, the information given is quite comprehensive and covers off-hand grinding, tool and cutter grinding, and belt finishing of carbides. Recommendations cover the use of silicon carbide and diamond grinding wheels.

W *Bkc Chc Nv.57/Bkc Chc Pe Rgc.57*

Diamond wheels by Carborundum for carbide grinding

The Carborundum Co, Niagara Falls, NY. 4 pp, 8½ × 11 in., illustr

Recommendations covering wheel type, wheel number, size, grading, and application (*ie* roughing or finishing) are given for the following: off-hand grinding of single-point tools, chipbreaker grinding, surface grinding, cutter grinding, cylindrical grinding, and form holding. Metal and resin bonds are available, and both should be used with a coolant.

W *Bk Chc Nv.57*

US-Burke precision wafering machine

Falcone Engg Inc, 487 Orange St, Newark 7, NJ. 2 pp, 8½ × 11 in., illustr

The latest information on the US-Burke precision wafering machine quotes users as reporting very high yields in slicing silicon and germanium. A 5 in. diameter diamond blade cuts wafers of 0.008 to 0.010 in. thick from 1 in. diameter boules without loss of slices. Minor variations between individual diamond blades can be compensated by the spindle speeds made available by use of a Thymotrol controlled motor.

W *Bfr Ceg Ng Pr.57/Bhc Ceg Ng Pr.57*

Metal bonded diamond segmental saws for concrete cutting

The Carborundum Co Ltd, Special Products Div, Trafford Park, Manchester 17. 4 pp, 8½ × 11 in., illustr

Metal-bonded segmental diamond saws for concrete cutting are produced in 12, 14, and 16 in. diameters; the standard thickness of 3/16 in. produces a ¼ in. cut. The following table shows the life that can be expected in three typical aggregates:

Aggregate	Minimum total length of cut in in./feet
Limestone	15,000
Granite	6,000
Flint	1,500/2,000

Advice is given on coolant supplies and cutting practice.

W *Bny Ceg Ng Urc.57*

Service Bulletin No 1—Diamond products by Carborundum

The Carborundum Co Ltd, Special Products Div, Trafford Park, Manchester 17. 8 pp, 5½ × 8½ in., illustr

This booklet is specially suitable for individuals and companies who are turning to diamond tools for the first time. The nomenclature of the diamond tool industry is briefly and clearly explained, and the diamond wheel marking system is described. Standard shapes of wheels, laps, and stone saws are illustrated on three pages, and the booklet concludes with hints on the use and care of diamond products.

W *N.57*

Service Bulletin No 2—Diamond products by Carborundum for off-hand grinding tungsten carbide

The Carborundum Co Ltd, Special Products Div, Trafford Park, Manchester 17. 4 pp, 5½ × 8½ in., illustr

The off-hand grinding of tungsten carbide tools is perhaps one of the most common workshop applications involving diamond wheels. Best results can only be achieved by following the recommendations of experts, and this Carborundum publication summarizes the most important factors to be considered. The recommendations cover bond type and grade of wheel, and also advise on the choice of lubricants. A table lists nine tool grinder manufacturers, and indicates the correct diamond wheel for use with their machines. The diamond wheels recommended are illustrated on the back of the catalogue.

W *Al Bkcb Chcz Nv.57*

Edibrac carbide tipped tools

Edibrac Ltd, Centurion Works, Broadheath, Altrincham, nr Manchester. 132 pp, 5¼ × 9 in., illustr

Edibrac is a suspension of microscopic particles of metal carbides in a cobalt bond. Nine grades are produced for different purposes, and tool shanks are coloured for grade recognition. Information is given covering speeds and feeds for use with the different grades, and a surface speed conversion table is reproduced.

Edibrac tips are available for those who wish to use their own shanks, and advice on assembly methods is given. Silicon carbide wheels should be used for rough grinding, and metal- or vitrified-bonded diamond wheels for finish grinding. Diamond grinding recommendations are made for chipbreaker grinding and other operations. Causes of carbide tool failure are listed. The majority of the catalogue shows the variety of Edibrac tips and Centurion tools available.

W *Pdc.57*

Service Bulletin No 3—Diamond products by Carborundum for universal tool and cutter grinders

The Carborundum Co Ltd, Special Products Div, Trafford Park, Manchester 17. 14 pp, 5¼ × 8½ in., illustr

Wheel types and sizes, together with recommendations on wheel speed, infeed, etc, are given for cutter grinding, surface grinding, cylindrical grinding, internal grinding, and chipbreaker grinding. Popular resin- or metal-bonded wheels for these purposes are illustrated.
W *Al Chc Pr:Nv.57*

Collected catalogues [Diamond tools]

E. Friedl & Co, Hernalser Guertel 32, Vienna IX, Austria

Brief information is given concerning the firm's single and multi-point diamond tools for truing and profiling grinding wheels. These are obtainable in five different qualities and in various settings. Other tools manufactured by this firm include glass cutters with different shanks for different purposes; drilling crowns with sintered carbide inserts, impregnated diamond particles, or a few diamond particles set with 'Ballas', or 'Brasil carbon' for the hardest types of rock; hardness testing diamonds with a special method of fixing and in various shapes; and finally precision turning tools with diamond inserts of various types. Examples of work produced with the diamond turning tools are shown. *A* *Njb.57|Njd.57*

Micromatic Spiralap

Micromatic Hone Corp, 8100 Schoolcraft Ave, Detroit 38, Mich. 7 loose leaves, 8½ × 11 in., illustr

Information on Spiralap lapping equipment is available on single sheets, punched ready for filing. The SPL-9A is a rotary flat lapping machine with 9 in. diameter lapping plates. The information sheets describe operating procedure and machine maintenance, and one sheet advises on abrasive selection. Lapping compounds and lapping accessories are listed.
W *Chd Pr.57|Chd.26.57*

Profilometer Equipment, catalogue 159

Micrometrical Mfg Co, 345 South Main St, Ann Arbor, Mich. 12 pp, 8½ × 11 in., illustr

Users of Profilometer surface finish testing equipment are recommended to obtain a copy of the latest catalogue which describes a whole range of tracers and special equipment. The catalogue is in four sections: (*i*) portable equipment for manual tracing; (*ii*) portable equipment for straight-line mechanical tracing; (*iii*) equipment for straight-line mechanical tracing on short or hard to reach surfaces; and (*iv*) equipment for circular tracing. *W* *Wgfb.57*

178 Constan

Moteurs Constan, 5 Quai Gambetta, Juvisy s/Orge (Seine et Oise), France. 6 pp, 8½ × 10½ in., illustr (In English)

The 178 carbide tool grinder uses aluminium oxide cup grinding wheels for the steel shanks, and silicon carbide cup grinding wheels for roughing the carbide. Tools of 1¼ in. square can be ground. Cut-away diagrams and photographs supplement the information given.
W *Al Bkc Chc Pl Rgc.57|Az Bfd Chc Pe Rj.57*

Grinder Type 238

Moteurs Constan, 5 Quai Gambetta, Juvisy s/Orge (Seine et Oise), France. 4 pp, 8½ × 10½ in., illustr (In English)

The 238 grinding and lapping machine is designed for carbide grinding and is supplied with two silicon carbide wheels. For grinding HSS tools, aluminium oxide wheels are provided. The fine adjustments possible on this machine are claimed to eliminate the need for much diamond grinding. The tool posts will take shanks up to 1¼ in. square, swivel through 180°, and slide across the table. The table is 17 × 10 in. and can be tilted up to 35°. A cut-away diagram clearly shows the principal parts of the machine, and further information is given in photographs.
W *Al Bfdg Chc Pe Rj.57|Al Bkc Chc Pe Rgc.57*

J. K. Smit & Sons industrial diamond tools

J. K. Smit & Sons Inc, Murray Hill, NJ. 62 pp, 8½ × 11 in., illustr

This catalogue—one of the largest and most comprehensive received recently—differs in one major respect from the earlier edition: a new chapter on diamond wheels has been included. It describes Secomet diamond wheels, wheel bonds, wheel types, truing, dressing, cooling, operating speeds, dry grinding, surface grinding, form grinding, hand honing, grinding hints, and wheel markings.

The bulk of the catalogue is unchanged: it covers standard diamond tools, shaped tools, diamond powders, laboratory core drills, and a wide range of other tools and accessories. *W* *N.57*

Zurium bonded diamond wheels by Super-Cut

Super-Cut Distributors Inc, 3418 North Knox Av, Chicago 41, Ill. 16 pp, 8½ × 11 in., illustr

Zurium-bonded diamond wheels are recommended for grinding carbides, ceramics, and special alloys. A selection of wheels available is illustrated and specifications are given. In addition to the normal range, wheels can be altered to suit individual requirements. Hand hones with single or double ends have recently been introduced by Super-Cut, and details of these are given. Also listed and illustrated are Super-Cut diamond wheel coolants, diamond dressers, and magnetic chucks with diamond rings. Described but not illustrated are single- and multi-layer plated diamond wheels and rings, and segmented diamond wheels for special applications.
W *N.57*

'Eze-Cut' resin bond diamond wheels by Super-Cut

Super-Cut Sales Inc, 3418 North Knox Av, Chicago 41, Ill. 8 pp, 8½ × 11 in., illustr

A selection of Eze-Cut resin-bonded diamond wheels for tool and cutter grinding is shown. All the wheels shown are available in different diameters, concentrations, etc, and these specifications are listed under each type of wheel. The wheels dealt with in this catalogue are straight peripheral, plain cup, dish, flaring cup, and diamond insert peripheral.
W *Nv Urb.57*

How is a grinding wheel made? Tyrolit

Tyrolit-Schleifmittelwerke Swarovski KG, Schwaz, Tyrol, Austria. 40 pp, 5¾ × 6 in., illustr

This attractive little booklet describes the manufacture of a grinding wheel from grit storage, through mixing, pre-pressing moulds, pressing, drying, firing, hardening, grinding, boring, forming, testing, and packing.
W *Re Qc.57*

Erodosharp Mark II

Wickman Ltd, Electro-Mechanical Dept, Upper York St, Coventry. 4 pp, 8½ × 11 in., illustr

Advances in Mark II include two electrode wheels, Wickman oil gravity feed, constant gap worktable, and improved fume extraction. The Erodosharp principle is now well-known and need not be elaborated here. A full description can be seen in *Ind Diamond Abstr* 1958 Vol 15 p A48 (Mar). *W* *Al Chcr Pr.57*

Percussive rock drill bits, rods and accessories

Rip Bits Ltd, Dronfield, Sheffield. 30 pp, 8¼ × 11¼ in., illustr

Tungsten carbide detachable bits, all-steel detachable bits, tungsten carbide tipped drill stems, drill rods for detachable bits, coupled drill rods, water flush devices, and accessories are shown. Nomenclature is explained and information given covers sizes, types, and uses. Two pages of grinding instructions for tungsten carbide tipped tools cover when to regrind, grinding equipment, grinding the cutting edge, and grinding the periphery. Wheels should conform to Carborundum classification GC80-K11-VR.

W *Bn Pl.57*

Impregnator—a portable unit for the carbide impregnation of steel cutting tools and dies

Wickman Ltd, Electro-Mechanical Dept, Upper York St, Coventry. 4 pp, 7 × 9 in., illustr

This introductory catalogue briefly explains the method of carbide impregnating with the Wickman Impregnator. Tool areas subject to considerable wear can be coated to a depth of 0.003 or 0.0005 in., according to the setting of a selector switch. Three styles of electrode are supplied : with chamfered, screwdriver, and scriber point ends. These can be ground to alternative shapes on a soft bond silicon carbide wheel or a diamond wheel.

W *Al Bfd Cs Rg.57/Ax Bfd Cs Rg.57*

'Najet' microscopic precision drills and drilling equipment

National Jet Co, 10 Cupler Drive, La Vale, Cumberland, Maryland. 46 pp, 8½ × 11½ in., illustr

In addition to describing precision drills and drilling equipment, the catalogue contains articles on 'The technique of micro-drilling', by J. A. Cupler, and 'A method of metallurgical microspectroscopy', by F. R. Bryan and C. H. Neven. A conversion table gives millimetric equivalents for 400 decimal inch sizes from 0.0010 to 0.0409 inch. A second table gives millimetre and decimal inch equivalents for 40 wire gauge sizes.

W *Cfbp Pl.2584.57/Pl.513*

[Permattach truing tools]

Permattach Diamond Tool Corp, Milford, New Hampshire. 4 pp, 8½ × 11 in., illustr

A variety of popular single-stone truing tools is shown. They are designed for specific makes of machine tools, and are guaranteed against stone loss or movement under normal usage. Phonopoint truing tools are much smaller than conventional truers, and can be obtained with oriented whole diamonds (Type AAA) or with lapped diamonds (Type BBB). Special shank sizes and types can be supplied as required. Thread grinder truing tools also use oriented whole diamonds.

W *Njb.57/Pf.57*

PATENT LISTS

BRITISH

The Official Journal (Patents) 1959 (3673) (July 8)

819,267 BIRMINGHAM SMALL ARMS CO LTD. Spark machining.

819,330 RANDALL, H. G. Cylindrical and segmental grinding wheels.

819,200 RAUCH, W. and SCHNITZLER, A. (trading as METABOWERK CLOSS RAUCH & SCHNITZLER KG). Grinding or polishing machines.

The Official Journal (Patents) 1959 (3674) (July 15)

819,622 GLEASON WORKS. Grinders for truing gear cutters.

The Official Journal (Patents) 1959 (3675) (July 22)

820,152 NORTON CO. Coated abrasive wheel elements.

820,090 KLINGELNBERG, G., JAEGER, G., KLINGELNBERG, H. W., and BAUM, C. (trading as KLINGELNBERG SOEHNE, W. F.). Method of, and apparatus for, the form dressing of grinding wheels.

820,107 WHEEL TRUEING TOOL CO. Form dressing apparatus.

820,046 NORTON GRINDING WHEEL CO LTD. Mounted points.

UNITED STATES

Official Gazette 1959 Vol 743 (1-5) (June)

2,888,738 K. M. TAYLOR, CARBORUNDUM CO. Sintered metal bodies containing boron nitride.

2,888,784 P. H. CLEFF, GT BRITAIN, PARSONS & MARINE ENGG TURBINE RES & DEV ASSOC. Means for generatively finishing involute gears.

2,888,839 O. WALDRICH. Grinding machines for work on heavy workpieces.

2,889,138 D. W. HAGLUND, SANDVIKENS JERNVERKS AB. Rock drill cutting insert.

2,889,141 H. R. WILSON, ENGINEERED EQUIPMENT INC. Mobile power concrete saw device having an adjustable cutting disk.

2,889,215 E. W. NELSON, CONTINENTAL OIL CO. Grinding composition vehicle.

2,889,665 W. F. JESSUP, G. L. GROVE. Compensating device for grinding machines.

2,889,666 L. COES jun, NORTON CO. Centreless grinding machine.

2,889,725 J. W. TURTON, R. M. STRICKLAND, UNITED GREENFIELD CORP. Carbide drill.

2,890,021 R. L. SANDVIG, THOR POWER TOOL CO. Drill bit.

2,890,551 E. T. DALTON, AMERICAN OPTICAL CO. Apparatus and method of forming ophthalmic lenses.

2,890,585 R. C. ALBRECHT, CROWN CORK & SEAL CO INC. Hardness tester.

2,890,694 H. C. MILLER, SUPER-CUT INC. Diamond dressing tool assembly.

2,891,137 A. C. GRAELL. Control circuit for electrical discharge metal machining apparatus.

2,891,358 R. J. AUMAN, A. MEYERHOFF, KERNS MFG CORP. Spiral rake compensator for cutter grinding machines.

2,891,534 W. S. OUNWAKE, LANDIS MACHINE CO. Grinding wheel dressing mechanism.

2,892,291 C. C. COLEMAN. Holder for glass cutter.

2,892,344 D. F. SKLAR, TORSION BALANCE CO. Convertible hardness tester.

2,892,345 D. F. SKLAR, TORSION BALANCE CO. Inner face hardness tester.

2,892,387 W. H. RUSELL jun, UNITED STATES OF AMERICA. Internal cutting device.

SOUTH AFRICAN

Official Journal 1959 Vol 12 (22-25) (June)

805/58 D. T. LIVEY, P. MURRAY, R. SCOTT, J. WILLIAMS, UK ATOMIC ENERGY AUTHORITY. Process for the production of ceramic bodies.

3784/58 W. H. MEAD, VACU-BLAST LTD. Dry honer.

AUSTRALIAN

Official Journal 1959 Vol 29 (16-20) (May-June)

221,456 E. J. LONGYEAR CO. Rotary core drill.

221,555 W. E. SYKES LTD. Metal-grinding machine.

SWISS

Patentliste 1959 (10-11) (May-June)

338,419 A. MEUTSCH. Rotary percussion drilling method and rotary percussion drilling machine for rock and other hard materials.

338,562 W. C. OBERLIN, PITTSBURGH GLASS CO. Machine for cutting a continuous ribbon of glass.

338,620 S. H. TORESON, AB, GOTAVERKEN. Method of testing the abrasion resistance of a material in a casting.

338,724 B. V. DAVIS, ARMSTRONG SIDDELEY MOTORS LTD. Machine for polishing or grinding lightly an elongated workpiece with a curved surface.

338,725 ZAVODY PRESNEHO STROJIRENSTVI GOTTWALDOV. Bearing arrangement of the worktable in machine tools for grinding profiled milling cutters and lathe tools using a template.

339,022 ISICO SA. Shock absorbing bearing, in particular for measuring apparatus.

(add 333,588)

339,028 A. MOTTU, SOCIETE GENEVOISE
339,029 D'INSTRUMENTS DE PHYSIQUE. Machine tool.

339,080 G. REINACHER, DEUTSCHE GOLD- UND SILBER-SCHEIDEANSTALT VORMALS ROESSLER. Method for machining the surface of metallic workpieces, in particular for grinding metallographic specimens.

339,143 P. BACHMANN, LAPIDOR SA. Support for the resumption of operations on machined workpieces..

339,144 H. MEYER, HOIRS, FABRIQUE DE MACHINES. Apparatus for machining workpieces for watch movements and small mechanisms.

FRENCH

Bulletin Officiel 1959 Vol 76 (3917-21) (May-June)

1,192,922 AGIE, AG FUER INDUSTRIELLE ELEKTRONIK. Method of removing material by electroerosion.

1,193,332 E. VAN VOORDEN. Device for guiding the saw frame on machines for sawing natural stones and on similar machines.

1,193,333 E. VAN VOORDEN. Balancing device for the framework of saws on machines for sawing natural stone and on similar machines.

1,193,348 E. F. HOFMANN. Device for measuring and controlling without contact on machines for grinding plane surfaces.

1,193,939 A. HUARD, M. GAUTHIER. Centring ring for grinding wheels and the like.

1,194,238 SA HERCKELBOUT & FILS. Machines for grinding spring ends.

1,194,510 J. O. EDSTROM. Process for preparing metal-ceramic materials and materials obtained thereby.

1,195,196 M. FERRAND. Abrasive tool and its method of manufacture.

1,195,317 F. L. CURTIS, CIE DES MEULES NORTON. Grinding wheel mounted on a stem for grinding holes of small diameter.

1,195,684 NV PHILIPS' GLOEILAMPENFABRIEKEN. Circular saw.

1,195,807 PETER SPENCE & SONS LTD, DEUTSCHE GOLD- UND SILBER- SCHEIDEANSTALT VORMALS ROESSLER. Method of producing corundum (α-aluminium).

1,195,862 INDUSTRIAL DISTRIBUTORS (1946) LTD. Method for modifying the properties of type IIb diamonds.

1,196,676 HYRESGASTERNAS SPARKASSE BYGGNADSFORENNINGARS RIKSFORBUND, OCH Y. F. LUNDQUIST. Method and machine for sawing stone.

1,196,700 L. GAFFURI. Machine, in particular for the polishing and grinding of plates of marble and the like.

1,196,784 AB SVENSKA KULLAGERFABRIKEN. Automatic grinder.

1,196,786 AB SVENSKA KULLAGERFABRIKEN. Method of automatic grinding, and device for carrying out the method.

GERMAN

Patentblatt 1959 Vol 79 (26-29) (July)

Applications Open to Public Inspection

1,060,568 H. OBRIST. Disk cutting device.

1,060,587 G. J. GOEPFERT, W. A. SPILSBURG, CARBORUNDUM CO. Grinding body and method for its manufacture.

1,060,735 R. TOUVAY, SA DES MANUFACTURES DES GLACES & PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY & CIREY. Grinding device, in particular for grinding glass plates.

1,060,736 DIAMETAL A-G. Profile grinding machine.

1,061,005 C. BALLHAUSEN, DEUTSCHE EDELSTAHLWERKE AG. Production of electrodes for spark erosion.

1,061,221 G. GERUNG. Grinding machine for the simultaneous grinding of both side faces of metal sheets.

1,061,222 E. F. RENDER, CINCINNATI MILLING MACHINE CO. Device for the centreless grinding of workpieces.

1,061,223 W. SAUTER. Device for grinding or polishing the frontal faces of disk shaped workpieces.

1,061,445 F. W. DEHMELT, TELEFUNKEN GmbH. Semiconductor crystal of a semiconductor device with particularly short life of the charge carriers and method for its manufacture.

1,061,647 FRITZ WENDT KG. Device for grinding chip breaker grooves.

1,061,650 GES D LUDW VON ROLL'SCHEN EISENWERKE AG. Grinding machine with mechanically coupled feed of grinding spindle and truing device.

1,061,662 W. OWEN, FRANZ KULMANN K-G. Pantographic engraving machine.

1,061,663 J. HEIDENHAIN, WENCZLER & HEIDENHAIN PATENTVERUERTUNG. Method of producing divisions and graduations, figures and marks, on hard materials such as hard metal, glass, porcelain.

1,061,917 R. RUEHLE, ROBERT BOSCH GmbH. Method and device for producing apertures in bodies by means of corpuscular rays.

1,062,033 C. W. GEHRING. Method and machine for testing grinding wheels and honing stones.

Patents Granted

927,437 C. BALLHAUSEN, DEUTSCHE EDELSTAHLWERKE AG. Powder mixture for applying hard metal to carrier materials, and method of manufacture.

ABSTRACT NOTIONS

Trade literature for you . . .

Trade literature reviewed in *Industrial Diamond Abstracts* is *not* available on loan. Readers wishing to obtain copies should contact the manufacturer whose address is shown at the beginning of the review.

. . . and for us

In order that readers may be kept informed of developments in the industrial diamond and allied industries, manufacturers are requested to send review copies of their trade literature to: Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1.

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. . . and a close shave

The Industrial Diamond Trade Names Index is now in preparation. Those firms who have not yet returned their forms are reminded that there is not much time left in which to do so: a delay in returning the form could result in the firm's name being missed from the Index.

Addresses

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September, 1959 Vol. 19 No. 226

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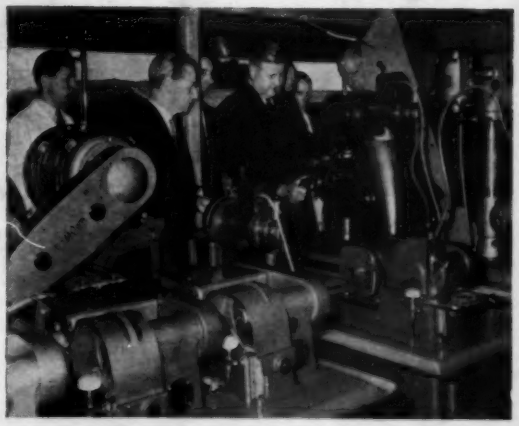

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